









Digitized by the Internet Archive
in 2008 with funding from
Microsoft Corporation

ANNUAL

OF THE

UNIVERSAL MEDICAL SCIENCES

A YEARLY REPORT OF THE PROGRESS OF THE GENERAL
SANITARY SCIENCES THROUGHOUT THE WORLD.

EDITED BY

CHARLES E. SAJOUS, M. D.,

LECTURER ON LARYNGOLOGY AND RHINOLOGY IN JEFFERSON MEDICAL COLLEGE, PHILADELPHIA, ETC.,

AND

SEVENTY ASSOCIATE EDITORS,

ASSISTED BY

OVER TWO HUNDRED CORRESPONDING EDITORS, COLLABORATORS,
AND CORRESPONDENTS.

Illustrated with Chromo-Lithographs, Engravings and Maps.

VOLUME III.



1888.

PHILADELPHIA AND LONDON:

F. A. DAVIS, PUBLISHER.

THE OCEANIC PUB. CO.,
Sydney, N. S. Wales.

}AGENCIES.....{

J. A. AIKEN,
Cape Town, Cape Colony.

Entered according to Act of Congress, in the year 1888, by

F. A. DAVIS,

In the Office of the Librarian of Congress at Washington, D.C.

Printed by
The M. J. F. Printing House,
No. 1214 F Street

OPHTHALMOLOGY.

By WILLIAM THOMSON, M.D.,
PHILADELPHIA,

ASSISTED BY
GEO. M. GOULD, M.D.,
PHILADELPHIA

SECTION I.

EMBRYOLOGY, ANATOMY, PHYSIOLOGY, ETC.

1. *The Pineal Gland and Eye*.—The discovery of the nature of the pineal gland in man, and its relation to the median or pineal eye of certain amphibia and lizards, is one that may have no practical significance; but it is one of decided scientific interest. Mr. Baldwin Spencer's beautifully illustrated paper¹ clearly demonstrates that the pineal gland (held by the philosopher Descartes to be the chief seat of the soul) is in all mammalia the rudiment of what was once a functional eye in the Ichthyosaurus, Plesiosaurus, and many other now extinct animals. In certain species of lizards, *e.g.*, the New Zealand Sphenodon, the process of extinguishing the median eye seems only partially carried out at the present time. At the vertex of the head there is a modified central scale covering a gap, the parietal foramen, in which lies the eye, connected by its stalk or optic nerve, with the epiphysis or pineal gland. The eye has all the essential ocular structures, retina, lens, transparent media, etc. In one species the pineal nerve does not exist, though the eye and gland are present. In yet others the eye is wholly within the skull, the parietal foramen having closed. The extreme vascularization of the human gland, and the presence in it of sabulous particles may, perhaps, lead to the demonstration of some function now useful to the organism.

2. *Intra-ocular Muscles of Mammals and Birds*.—The results of Mr. Jessop's experiments on mammals and birds² show that the iris is supplied by the short ciliary nerves producing pupillary con-

traction, and by the long ciliary nerves producing dilatation. In mammals the short ciliary nerves contract the ciliary muscle and the long ones relax it. These facts correlate the unstriped intra-ocular muscles of mammals with the involuntary muscular fibre of the heart, vessels, intestines, etc. The author concludes there is no distinct dilator muscle of the pupil,—a matter about which there is no unanimity of opinion among investigators. Those denying the dilator suppose the constrictor fibres overcome the inherent elasticity of the iris.

3. *Central Origin of the Ocular Fibres of the Facial Nerve.*—Proceeding from the commonly observed fact that in cases of hemiplegia resulting from cerebral apoplexy the muscles of the lower part of the face may be paralyzed, whilst those muscles supplying the structures about the eyes that are innervated by the facial preserve their normal activity, Herr Mendel¹ has made an extended and painstaking series of investigations to determine the nuclear origin of the nerves of these parts. He proceeds on the method of Gudden, removing muscles, however, instead of nerves, in young rabbits and guinea-pigs, and some months thereafter localizing the atrophied centres. It is found that the upper muscles about the eye supplied by the facial do not, as heretofore supposed, originate in the nuclei of either the general facial or the abducens, but in the posterior division of the oculomotorius nucleus. It is therefore highly desirable that in cases of pure ophthalmoplegia externa in man the normality of the orbicularis, etc., should be tested, and, if possible, a post-mortem examination should locate the central lesion. The published cases, being deficient in one or more of these particulars, are thrown out of the count by Mendel. Birdsall's case² is the only one confirmatory of the supposition that in man the same law holds as in animals. The author reminds us that there are other instances of fibres having a common origin proceeding to their peripheral distributions by different routes. By experiments upon kittens, Nussbaum³ finds the nucleus of the oculomotorius connected by crossed fibres with the longitudinal fibres from the aqueduct of Sylvius, and thus eventually with the abducens nucleus of the opposite side.

4. *Constitutional Diseases of the Eye in the Light of Embryology.*—Tweedy⁴ points out many highly suggestive and interesting facts in this connection. He first emphasizes the intimate corre-

spondence between the development and functions of the brain and those of the optic nerve and retina, since these last are genetically direct and early outgrowths of the brain. It is also notable that the eye and its appendages receive the whole, or parts, of six out of the twelve pairs of cranial nerves, and the concurrence of ocular development in organic evolution with the development of powers of locomotion receives a side-light from pathology in the connection between locomotor ataxia and visual failure. These things point to the intimate relationship existing between the eye and the rest of the body. No other organ of the body contains so many different kinds of histological elements or textures of so high a quality as the eye. Hence the immediate participation of the eye in general or constitutional diseases. The embryological origin of the various structures of the eye from the layers of the blastoderm is thus represented schematically on the following page.

It is thus seen that there is a histological and physiological relationship between the epiblastic elements of the eye and the epiblastic tissues in the rest of the body, and between the mesoblastic tissues of the eye and all other mesoblastic tissues. The pathological relationship is none the less intimate and exact; the cutaneous eruptions of strumous children, the eczemas, herpes, impetigos, etc., are concomitants of the phlyctenulæ of the epithelial layers of the cornea. In ophthalmic herpes the corneal change is likewise epiblastic. Syphilis, on the other hand, is a disease of mesoblastic textures, and ocular syphilitic affections are found to be of mesoblastic origin. The notched, pegged, and stunted teeth of inherited syphilis are not faults of the epiblastic enamel, but of the mesoblastic dental papillæ. Though epiblastic portions of the eye may become secondarily involved, the lesion begins in the mesoblastic structures. These and other analogies are valuable not only for diagnostic purposes, but also for therapeutic uses. Certain drugs have a special affinity for particular tissue-elements, and this fact may be utilized in prescription.

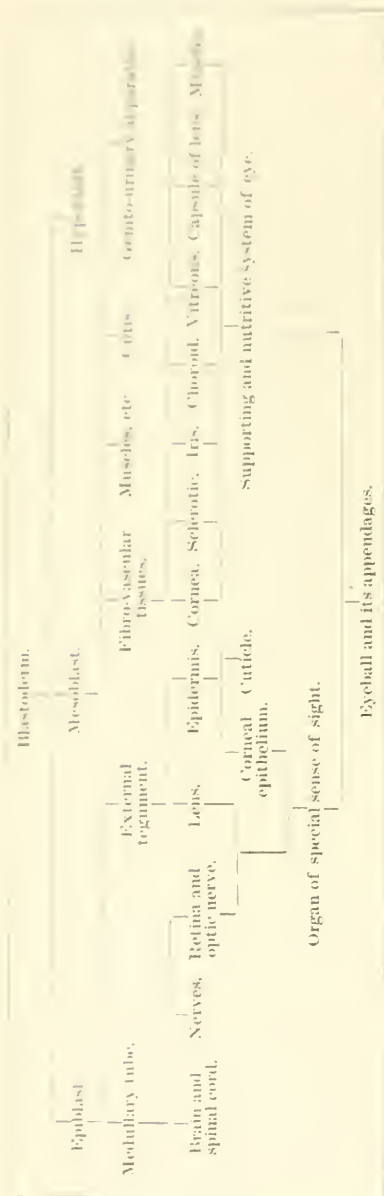
5. *Monocular and Binocular Closure of the Lids.*—When in man one eye is threatened by an approaching object, the other eye closes as promptly as the one in danger. In rabbits, birds, guinea-pigs, and frogs it requires an extremely strong stimulus to produce the closure of the non-endangered eye. Langendorff⁸ explains this as arising from the fact that in man the eyes being directed for-

wards and the visual fluids overlapping, there is a common "danger-field," and injury is thus obviated by the closure of both eyes. In the above-mentioned animals the "danger-field," except in great possibilities of injury, do not overlap and therefore but a single

cyclid closes in ordinary stimulation. Electric stimulation of the brain of the rabbit with a weak current produced closure of the opposite eye alone; only by very strong discharges did both lids close.

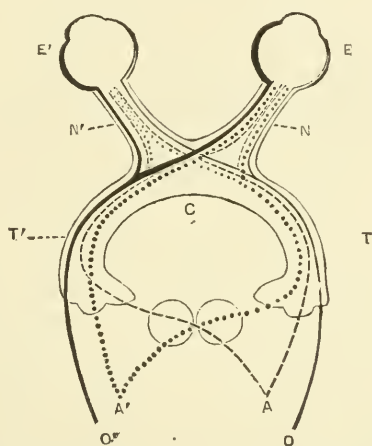
6. *The Motor Apparatus of the Eye in Man and Vertebrates*—

The extensive studies of M. Moitais⁹ present many points worthy of notice; but that relating to the nature of the capsule of Tenon is particularly valuable. This structure is held to be the common aponeurosis of the muscles of the orbit, forming a complete diaphragm or funnel about the circumference of the orbit of which the tendons form an integral non-detached portion. At the point of reflexion a subconjunctival fascia extends from the aponeurosis to the cornea. Beneath the muscular aponeurosis or external capsule there is a thin membrane enveloping the bulb of the optic nerve and extending to the muscles. This is called the capsule of the bulb or the internal capsule, and is the serous membrane of the eye. The separation of the serous and muscular aponeurosis and the uniting of the tendons of all the external



muscles in a common aponeurosis, thus has important bearings, not only upon the physiological functions of these muscles, but has also much to do with the surgery of these muscles in cases of strabismus and paresis. As Powers² says, every one must have experienced unexpected and unexplained instances of failure in the treatment of cases of squint. For those interested in the subject there is to be found nowhere else so complete an exposition of the anatomy of these structures in all species of animals.

7. *Cerebral Centres of Vision.*—In Ferrier's new edition¹⁰ the visual centre is now located in the occipito-angular region instead of in the angular gyrus. Blindness of the opposite eye caused by destruction of one angular gyrus lasts only one day, whilst destruction of both gyri does not produce binocular blindness for over four days. Ferrier's recent view is shown by the annexed figure.



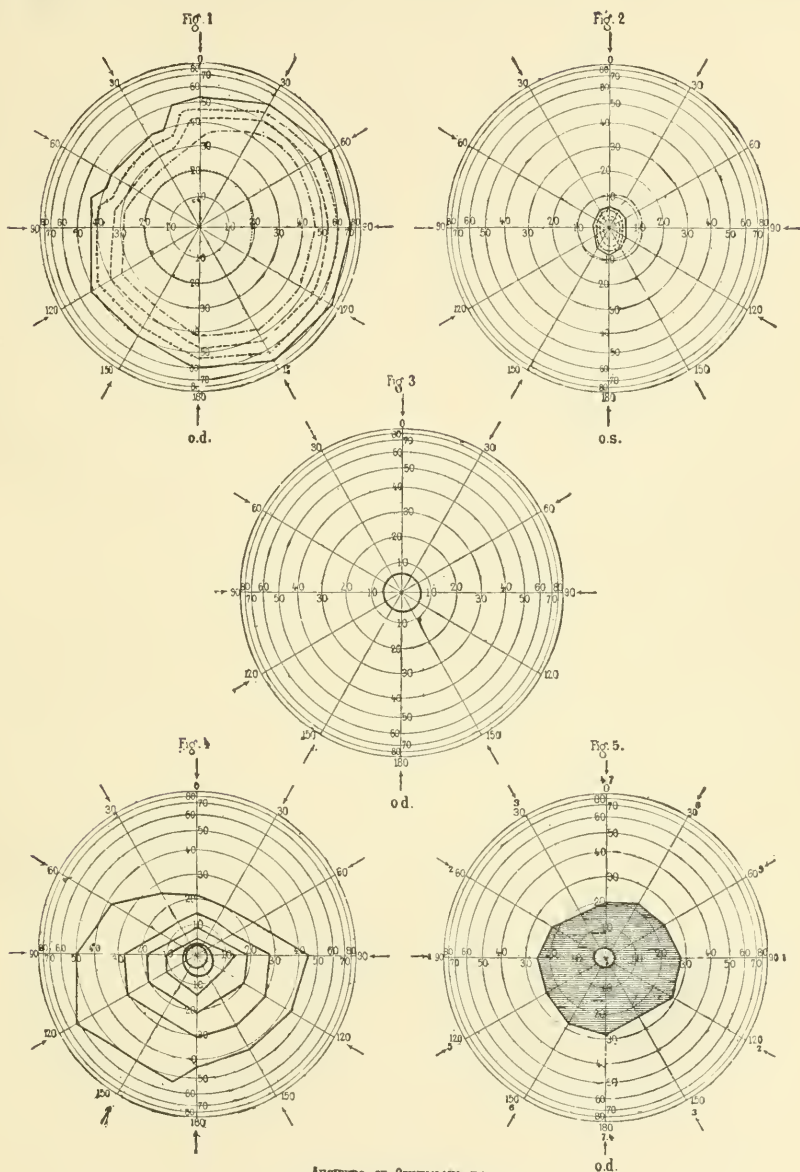
A the right, A' the left angular gyrus; C optic chiasma; E the right, and E' the left eye; N the right, and N' the left optic nerve; O the right, and O' the left occipital lobe; T the right, and T' the left optic tract; the thin continuous line represents the retinal relations of O; the thick continuous line represents the retinal relations of O'; the interrupted line indicates the retinal relations of A, and the dotted line the retinal relations of A'; the relations of A and A' with the eye on the same side are indicated by finer interrupted and dotted lines respectively.

Ferrier concludes that the corpora quadrigemina are not visual centres properly speaking, but are probably coördinating centres between retinal and other sensory impressions and motor adjustments. Ferrier's conclusions are based on experiments upon animals, and are interesting as furnishing proof (if it were needed) of the much-more-satisfying and conclusive researches of Seguin¹¹

upon the results of clinical and post-mortem studies in man. From these the conclusion seems indisputable that the cortical centre of vision in man lies in the cuneus of the occipital lobe. Dr. Mooren¹² places the color-sense on the most exterior cortex of the cuneus; beneath this is another layer, the centre for acuteness of vision; whilst in a third layer, lying yet deeper and next to Gratiolet's visual radiations, is the visual or light centre, the centre for visual field. Destruction of the upper or color-centre may exist without affecting the other layers. Bouveret¹³ gives the details of a case of total blindness without noteworthy implication of other senses, caused by atheromatous posterior cerebral arteries with softening of the cunei. Hun¹⁴ reports a case where there was during life a defect in the lower left quadrant of the visual field of each eye. From the post-mortem examination of this and a case reported by Monakow it is concluded that the fibres from the right upper quadrant end in the lower half of the right cuneus; that those from the right lower quadrant end in the adjacent part of the right median occipito-temporal convolution; that the terminals of the homonymous retinal halves are in the lower half of the cuneus and the neighboring median occipito-temporal convolution; that simple visual sensation is carried on in the median surface of the occipital lobe, and complete visual perceptions on the convex surface.

8. *Coexcitation of Homonymous Visual Fields*.—Schiele's remarkable study¹⁵ shows a complete interdependence of the visual fields. The late Professor Randolph, of Philadelphia, proved by an extended series of experiments that the fatigue of a certain set of muscles—finger, hand, etc.—took place much earlier after the corresponding muscles of the other side of the body had been tired than if they had been exhausted prior to the others. Schiele's experiments upon neurasthenic patients with contracted fields show that fatigue of one eye, with consequent contraction of the field, is followed by a proportional and concurrent contraction of the field of the non-used eye. The fatigue is therefore not retinal, but cerebral. The experiments with limited divisions of the retina, which were followed by synchronous reductions of the limited corresponding portions of the field of the resting eye, are particularly striking. One wonders, however, if the concentric reductions are not altogether too exact and mathematical to correspond to the actual facts. If so, it is of course wholly unintentional on the author's

part. We give herewith reproductions of the perimetrical observations:—



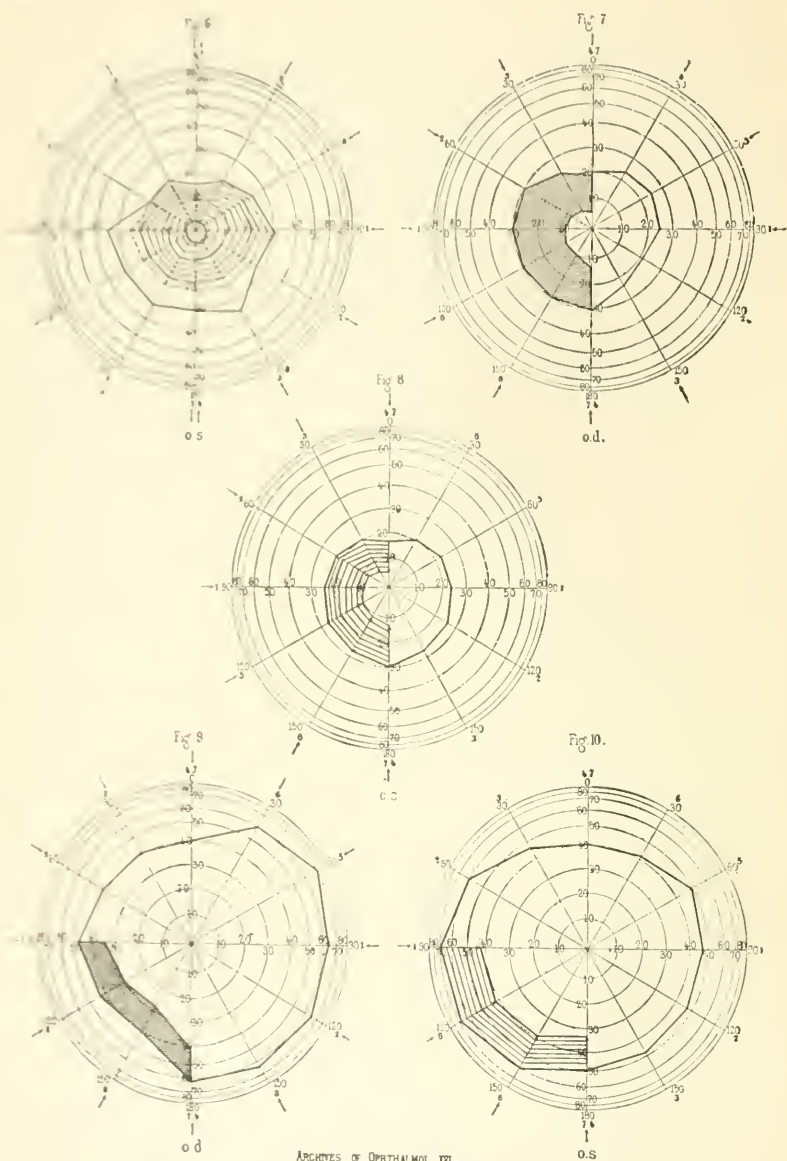
ARCHIVES OF OPHTHALMOLOGY.

J. F. Bergmann, Wiesbaden.

SCHIELE'S HOMONYMOUS VISUAL FIELDS.

Figures 5 and 6 illustrate Case 2, in which the fatigue was concentric and equal in both. Figs. 11 and 12 illustrate cases

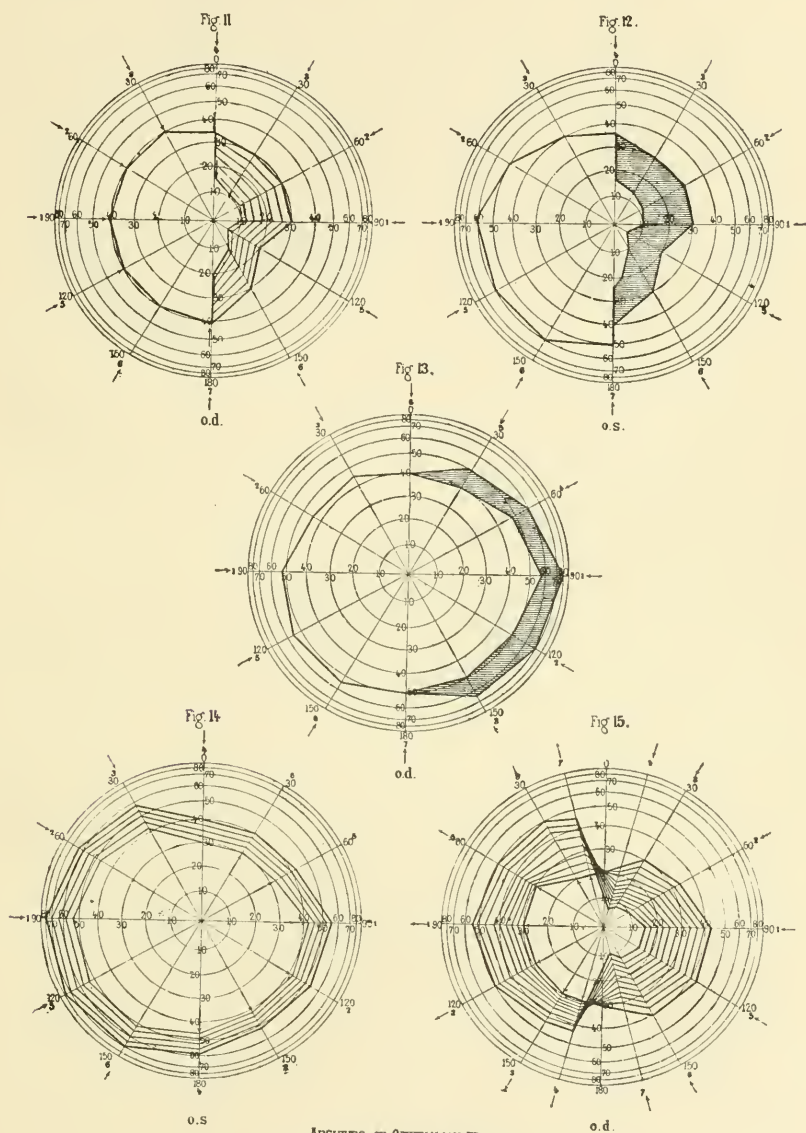
of neurasthenia and hysteria in which corresponding halves were fatigued. Figs. 13 and 14, a case of hysteria, show contraction



ARCHIVES OF OPHTHALMOLOGY, XVI.
F. F. Bergmann, Wiesbaden.
SCHIELE, HOMONYMOUS VISUAL FIELDS.

of one eye induced contraction of one half of the field of the other. Figs. 15 and 16, likewise a case of hysteria, show dilatation of one

half of a visual field, whilst the other half is contracted; the same condition is induced in the homonymous halves of the other eye.

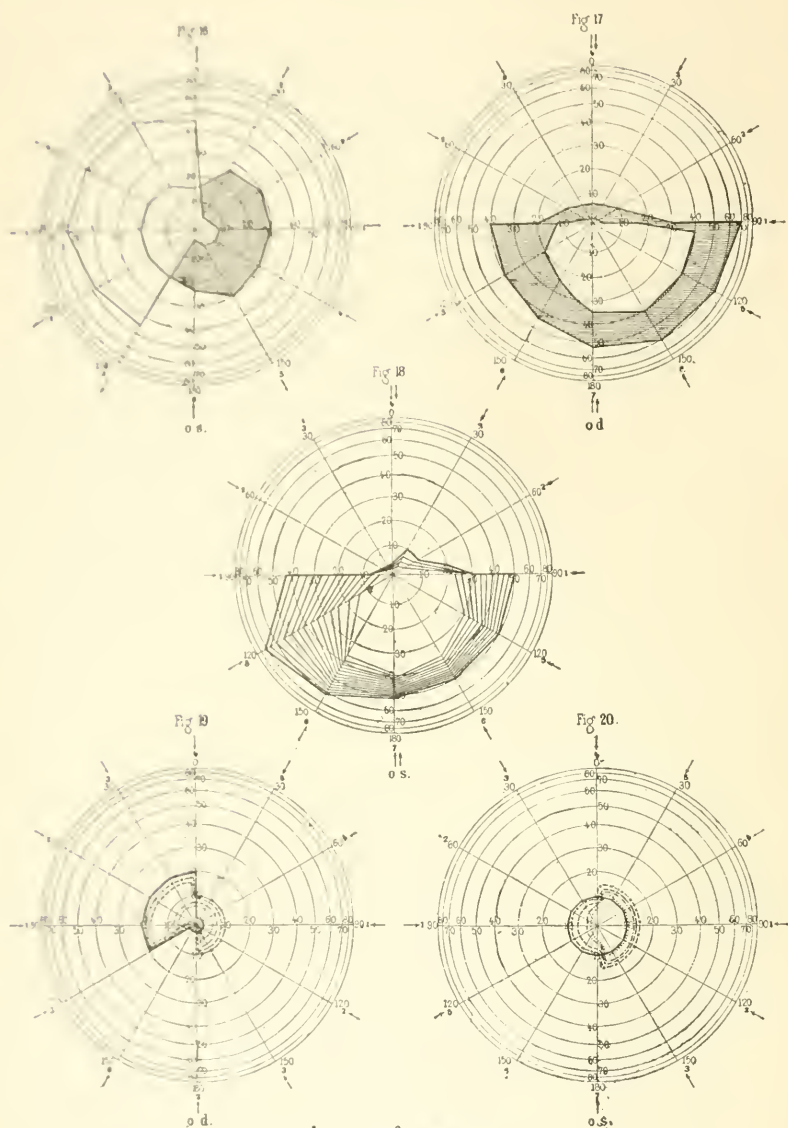


ARCHIVES OF OPHTHALMOLOGY
J. F. Bergmann, Wiesbaden.

SCHIELE, HOMONYMOUS VISUAL FIELDS.

The same irritation diminished the function in one half of the field, whilst acting as an excitant in the other. Figs. 17 and

18 show the degree of excitation as uniformly increasing or decreasing in the adjacent meridians of one half of the field, but

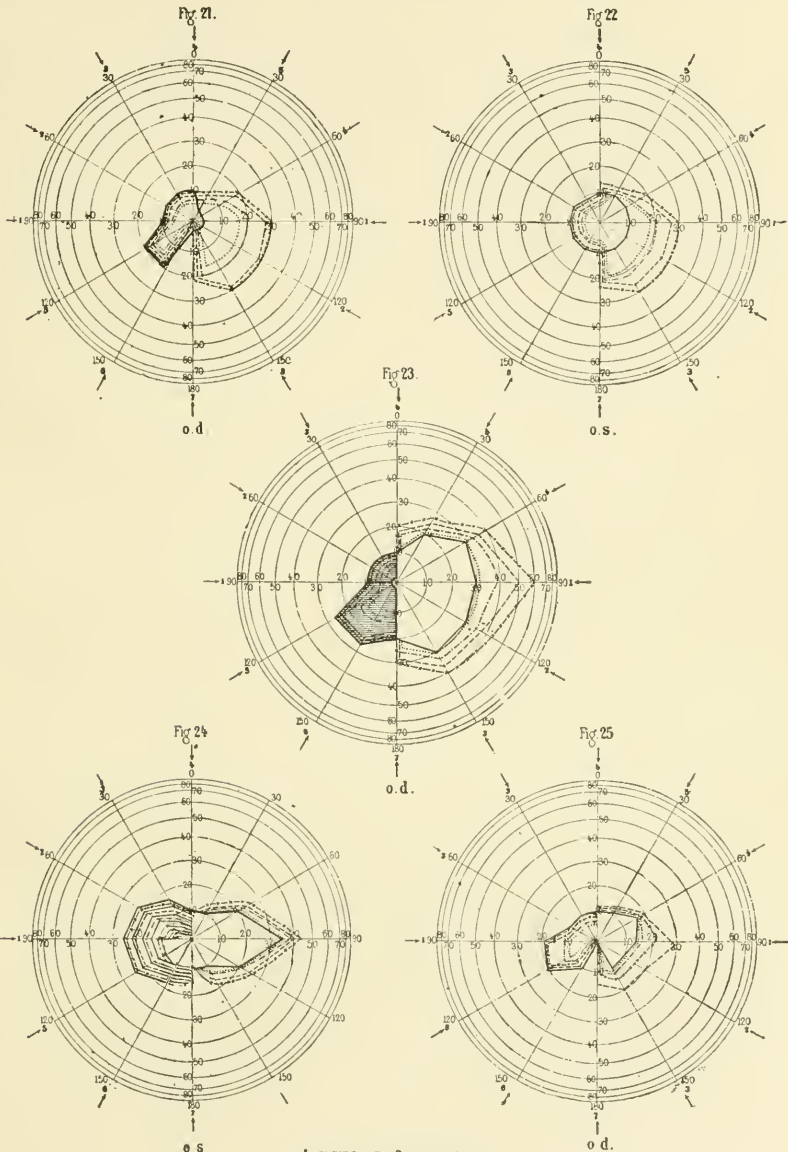


ARCHIVES OF OPHTHALMOLOGY
J. F. Bergmann, Wiesbaden.

SCHIELE'S HOMONYMOUS VISUAL FIELDS.

remaining unchanged in each single meridian. Figs. 7, 8, 23, 24, 19, 20, 21, 22, 25, 26, 27, 28 illustrate cases where the fatigue of

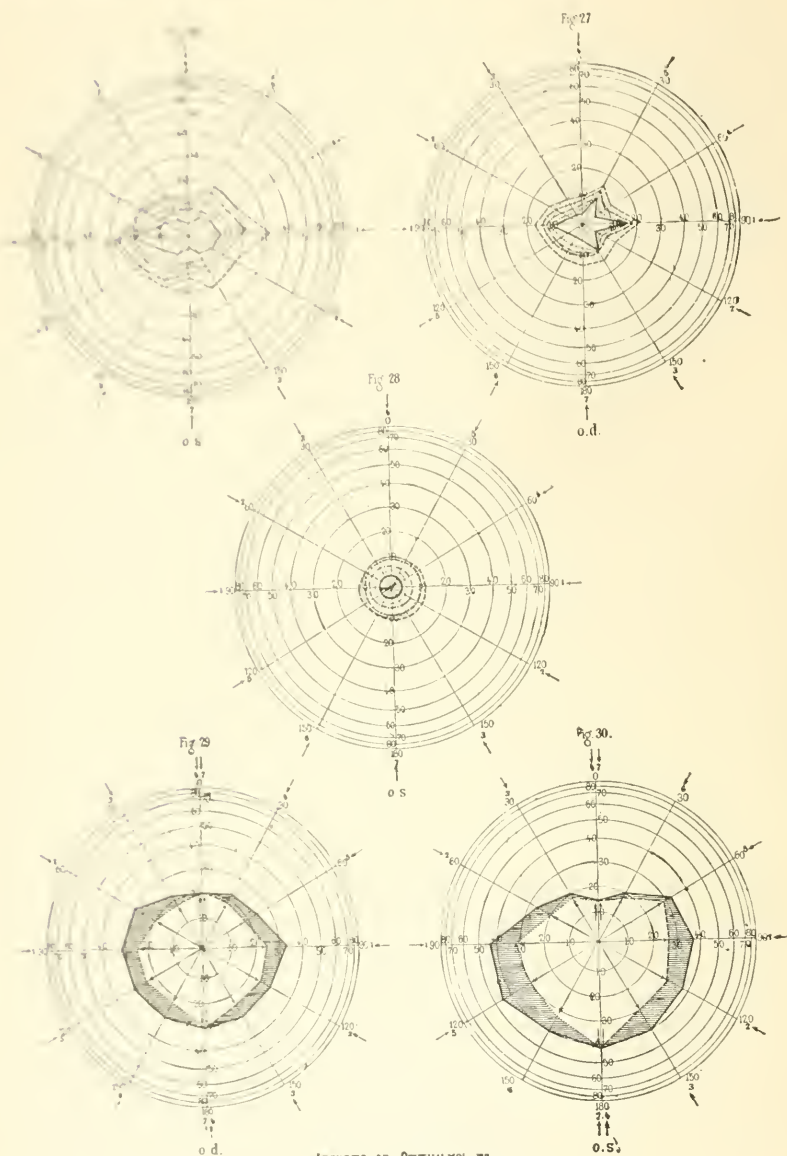
one half of the field affects the homonymous half of the other in a similar way. Figs. 29 and 30 represent the contractions obtained



ARCHIVES OF OPHTHALMOLOGY.
J. F. Bergmann, Wiesbaden.
SCHIELE'S HOMONYMOUS VISUAL FIELDS.

when first the outer limit only is determined; but the extent of each meridian is measured by carrying the visual object from one

side of the meridian to the other. The limitation of homonymous retinal fields is incompatible with Wernicks' views on the pro-



ARCHIVES OF OPHTHALMOLOGY
J. F. Bergmann, Wiesbaden.
SCHIELE'S HOMONYMOUS VISUAL FIELDS.

jection of the visual centre, according to which there is in each occipital lobe a demarkation-line of the homonymous halves of

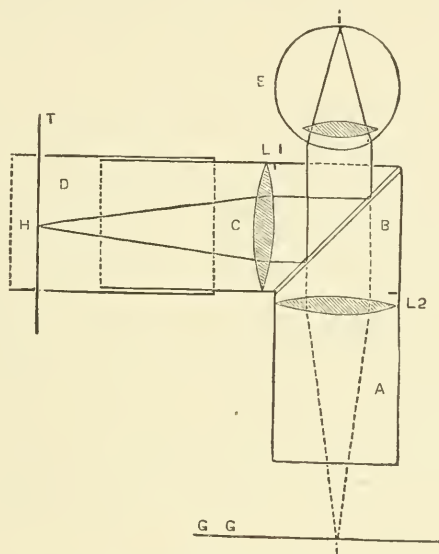
the retinae corresponding to the vertical lines of separation of the two visual fields.

9. *Retinal Studies*.—Borysiekiewicz's investigations¹⁵ of the ultimate construction of the retina comprise studies of human eyes, together with those of elephants, tigers, leopards, cats, etc. Among the conclusions reached are the following: The fibres of Müller begin at the membrana limitans interna and end as rods and cones. In all probability they proceed uninterruptedly through all the retinal layers. The rods and cones represent the ends of the radical fibres, and do not therefore correspond to nerve-endings proper. The rods and cones are not the regularly arranged and isolated bodies commonly pictured, but are stretched apart or crowded together irregularly by the intrusion of granular cells. The light-perceiving or transforming organs must be placed between the inner and outer granular layers, within the Müller's tubules. Angelucci's experiments¹⁶ with electric currents upon frogs lead him to conclude that the rods and cones are as certainly the direct intermediates of light and color-perception. Charpentier's researches¹⁷ give greater precision to the relations and reactions of the retina to the etherial stimulation. There is an exact relation between the duration of excitation and the intensity below which perception does not arise. There is also a maximal duration above which the luminous intensity does not vary. A luminous sensation is composed of the cumulation of elementary sensations of exceedingly brief duration, and the resultant intensity is proportional to the number of elementary sensations produced during the interval of time under consideration. The persistence of the luminous impression is governed solely by the intensity of the sensation, whether the stimulus be short or long. Color influences the persistence of retinal impression, not by its peculiar characteristic, but by its intensity. The persistence of luminous impressions diminishes with augmentation of illumination, and *vice versa*. In weak illumination, and for luminous excitations of brief duration, the persistence of the impression varies in inverse ratio to the square root of the illumination. (The interested student may profitably compare these results with Uthoff's researches, and those of DuBois-Reymond, in Gracfe's "Archiv," xxxii., 1886). Wertheim,¹⁸ repeating DuBois-Reymond's conclusions (1881), finds that they are correct as regards the equality, at the centre of the fovea, of

the number of cones, and the number of sensitive points. He further asks if this proportion holds for the outlying portions of the retina, where the visual acuity and the number of the cones gradually decreases. At the border of the macula (not calculated by DuBois-Reymond), the proportion is preserved, but beyond this point it does not obtain if the rods be considered as sensitive elements. This necessitates the conclusion that if the rods participate in vision they do so, not singly, but in groups. According to Salzer's observation, the number of cones is seven or eight times the number of optic nerve-fibres; and the supposition is therefore made that the fibres are unequally divided among the cones so that every cone of the fovea has an optic-nerve fibre, but beyond the fovea there is but one fibre to several cones. The enlarged area of sensitiveness beyond the fovea would in this way correspond to the single nerve-fibre. Knies¹⁹ proposes a theory of color-perception midway between that of Hering and Helmholtz, and which therefore seeks to combine the advantages of both. Four primary colors are supposed,—red, yellow, green, and blue,—because, firstly, spectra that are successively conjoined persistently produce one of these colors. Two of these belong to the more refrangible half of the spectrum, and the others to the less refrangible half, and they are complementary in pairs. The author believes his theory harmonizes the facts of physiology and pathology (color-blindness) better than others; but, of the making of color-theories there is no end! Mr. Wherry²⁰ adds to his case of unioocular diplopia, reported in 1883, a patient troubled with unioocular triplopia. The first was an astronomer, the last a microscopist, though (as if to add to the confusion of the physiological philosopher) it is noted that the eye multiplying the images was not the one used in microscopic work. Gunn²¹ thinks the phenomenon of the “watered or shot-silk” appearance of the retina is caused by the reflected light of the mirror from unequal, sloping, or curved surfaces (caused by vessels, fovea, etc.), that illuminates an area of the neighboring retinal surface, and thence is again reflected through the pupil into the observer's eye. Dr. Rosebrugh²² has so far succeeded in photographing the retina that the ultimate success of the attempt seems possible. The apparatus is figured in the annexed illustration. The great difficulty met with is that the cornea reflects so much of the light

that the light from the fundus is too feeble to illuminate the prepared plate.

M. Panel²³ formulates the conditions of successfully photographing the retina, but has not realized the ideal. Dr. Howe⁵¹ has succeeded in getting a series of photographs. The length of exposure was about fifteen seconds. The negatives were necessarily very small. Barr¹² explains his method of photographing the fundus by means of ortho-chromatic dry-plates; he considers his results more successful than any so far.



ROSEBRUGH, PHOTOGRAPHY OF THE FUNDUS OCULI.—A, the camera tube. B, an extension outwards of the camera tube. C, a tube meeting tube B at right angles. D, the sliding tube for carrying the object to be photographed. E, the eye. P, the plate glass. T, the transparency. L¹, L², the lenses. G G, the ground glass at the back of the camera for adjusting the focus and where the prepared plate is placed. h, a single point of the illuminated object on the transparency. i, the image of this point on the retina of the eye. E. j, the photographic image of this point on the plate at the back of the camera.

10. *Nutrition of the Eye*.—Panas²⁴ has studied the nutrition of the eye by the aid of experiments with fluorescin and naphthalin. It appears that the nutrition of the crystalline lens depends upon the normal function, especially of the retina, but also of the vitreous, and the resultant current proceeding from the retina and optic nerve across the vitreous. The question as to the method of the production of cataract by naphthalin or by the vibration of tuning-forks (Stein) remains an open one. Gifford¹⁴ found that

substances injected into the cerebral subdural space were subsequently found in the subdural and subarachnoid spaces of both optic nerves. None were found in the nerve or subarachnoid space. Quinke's experiments (1872), that the current is from the brain towards the eye, are therefore confirmed. Randall²⁵ reports a case of a large retinal vein crossing the macular region, and Kollock²⁶ a case of venous anastomosis on the disc. Dr. C. S. Turnbull gives the details of a case of persistent pupillary membrane, showing a clear relation of the membrane with the anterior layer of the iris, the sphincter muscle being in no way involved.

11. *The Pupil and Iris*.—Mislowsky²⁶ found no portion of the cerebral cortex (of cats and dogs) that did not, upon stimulation by weak currents, produce dilatation of the pupil. Jegorow²⁷ believes that his experiments on animals prove that the pupil-dilating nerves leave the ganglion of Gasser with the first branch of the trigeminus nerve, and, without passing through the ciliary ganglion, pass directly to the iris by the long ciliary nerves. Ivanoff²⁸ found only 9 per cent. of thirty-four healthy subjects had equality and symmetry of the two pupils, and thinks it depends upon an asymmetrical development of the cerebral hemispheres. In 54 per cent. the left pupil, and in 73 per cent. the left side of the face, was larger than the right. Peczely's astounding discovery (which his enthusiastic pupil Schlegel²⁹ thinks the second great discovery of homœopathy) is that the iris, by its discoloration, etc., indicates the locality and nature of pathological lesions (wounds, especially, but also chronic inflammations and abnormalities) in any and all parts of the body. The figures of the annexed cut show the positions of the iritic discolorations that correspond to definite lesions of the body. Ophthalmology is a serious science, but gravity may not be insisted upon in this connection.

12. *Intraocular Tension*.—Bellarminoff³⁰ has studied the tension of animal eyes by the aid of his photographic manometer, and finds that the tension is the same in the anterior chamber and in the vitreous; the intraocular pressure-curve agrees with that of the general blood-pressure in the carotid only when unaffected by special (vaso-motor) nerve influence acting upon the ocular vessels; irritation of a vaso-motor centre induces a slower increase of tension, a slower attainment of the maximum, and a slower return to normal, than the corresponding steps of the general blood-pressure;

the greatest lack of correspondence between the two curves is when the tonicity of the ocular vessels is locally changed; irritation of the Gasserian ganglion produces different results according to where the needle is applied, and the effects show the presence in it of both vaso-dilator and vaso-constrictor fibres; encephalic irritation of the motor-nerves of the eye gives a brief and insignificant increase of tension; there is no correspondence between intra-ocular tension and pupillary movement; strong light produces slight increase, though in the myosis of eserine diminution of tension is noted; stationary with atropine; respiratory movements (normal) result in no change of pressure beyond one to two millimetres.

13. *Relations of Corneal Curvature to the Circumference of the Head.*—The examination of 203 soldiers (normal visual acuity and refraction) by Bourgeois and Tscherning³¹ showed that there existed a relation between the circumference of the head and the radius of corneal curvature. The latter varied between 7.78 and 7.92 millimetres, whilst the circumference of the head rose from 54 to 60 millimetres.

14. *Congenital Aphakia and Anophthalmos.*—Baker³² reports a case of the rare occurrence of congenital aphakia in an otherwise well-formed and normal boy; and Collins,²¹ a case of binocular anophthalmos, together with an interesting study of all the reported cases of the defect,—thirty binocular and twelve minocular.

SECTION II.

DISEASES OF SPECIAL ORGANS.

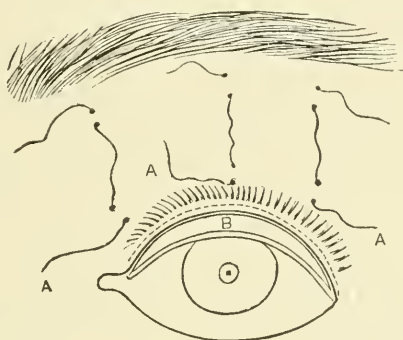
15. *Diseases of the Lid.*—Mr. Teale's¹⁴⁰ treatment of *tinea tarsi* is as follows: "Having rendered the conjunctiva insensible by cocaine, the surgeon first cuts off the eyelashes close to the crusts; then, with Squire's scoop, scrapes off every scrap of crust, as well as the surface of the exposed ulcerations. He then very carefully paints every raw surface with glycerine and carbolic acid (1 in 10), taking care that the brush is not too much loaded. The next step is to dredge iodoform over the edges of the lids, and even into the eye itself. Finally, the orbits are filled with absorbent cotton-wool, and the pads are firmly fixed by broad straps of plaster. The pads

may be removed in forty-six or seventy-two hours, and often do not need to be renewed."

For *styges* Abadie³² recommends a solution of boric acid gr. xv. to the ounce, applied several times daily.

Cuarn³³ reports two cases of *erectile tumors of the lids* successfully removed by the cautery. For *lupus vulgaris* of the lids Ware³⁴ used with satisfaction pyrogallic acid. Randall² describes an *encapsuled sarcoma* of the lid which had been mistaken for *chalazion*, and the repeated operation for removal of the supposed cyst only resulted in its recurrence at later dates. Recognizing its true nature, thorough removal by incision through all the tissues was made. Tartuferi³⁵ gives the details of the removal of two pearl-gray *transparent cysts* of the lids, and concludes that these growths arise from the glands of Moll, either by obliteration or occlusion of the ducts. Alt³⁶ calls attention to his conviction that *face-powders* are a frequent cause of *blepharitis-ciliaris*. Dehenné³⁷ operates upon *Chalazion* by holding the everted lid between the thumb and finger of the left hand, and immediately after the incision squeezes the contents out without any instrument. In operations of *skin-grafting* on the lids Wicherkiewicz¹⁸ proceeds under the strictest antiseptic precautions. He first unites the upper and lower lids by sutures, and then excises all the cicatricial tissue and adhesions of healthy skin, laying bare the area upon which the flap is to be made. This is then covered with iodoform gauze for several days until all exudation and secretion has disappeared. The transplantation is then made with more certain success than if made upon the fresh wound, the capillary hemorrhages and secretions of which prevent the speedy and complete rooting and nourishment of the graft. In blepharoplastic operations Gräser⁴⁰ lays the grafts on the fresh, but clean, dry wound, in tiny lamellæ, overlapping each other like roofing-tiles. The pieces should include only the rete mucosum and papillæ. For the relief of *trichiasis and entropion* Hotz¹² does not find Stellwag's operation satisfactory, and proposes the removal of a wedge-shaped piece of the cartilage, a ribbon of skin cut from the flap, and sutures carried in through the edge of the flap, then through the upper border of the cartilage and out through the upper margin of the incision in the lid. Benson⁴¹ uses electrolysis in all cases of partial trichiasis; but when the cilia are too numerous he splits the lid-edge and inserts a piece of mucous

membrane in the cleft. Dr. Millingen² also gains freedom of the conjunctival surface by transplanting a piece of mucous membrane, but he keeps the gap open for twenty-four hours by sutures passed through folds of skin, by means of which the lid is kept from closing. The method of applying the suture is shown in the annexed cut. W. F. Smith⁴³ explains his method of transplanting a narrow strip of cuticle, without pedicle, in such a manner as to supply the tissue lost by atrophy at the inner margin of the lid, and in this way lifting the lashes away from the bulb. Dehenné³⁷ is very enthusiastic in praise of the application of the thermocautery in entropion. He burns a furrow parallel with the border of the lid, three to four millimetres from the roots of the cilia, clear through all the structures to the conjunctiva. The cicatrice soon disappears, and in eighty operations the operator has seen no



SMITH'S ENTROPION OPERATION.

case of eversion from too great contraction of the cicatricial tissue, and thinks failure is only probable from timidity in making the furrow insufficiently deep and large. Professor Jacobson²⁷ recommends the insertion of a skin flap (not detached from the skin of the face) into the intermarginal section of the lid (according to the Jaesche-Arlt method), and stitching the upper margin of the flap at three points to the ciliary border, the lower margin to the edge of the tarsal tissue. The claim of superiority for this method is made that it does not dislocate the cilia, and also that it exposes only a flap of skin, not the ciliary border, to the risks of transplantation. Dr. Burchardt²⁷ points out the fact that Professor Jacobson's operation was in all essential particulars described by himself six

years previously. Burchardt explains improvements in detail and technique that he has since made. Denotkin⁴² splits the lid by intermarginal section, laying the tarsal cartilage bare to its full extent; the cartilage is then thermo-cauterized parallel with the border of the lid; antiseptic bandages are removed in eight days.

In spasmodic entropion, McKeon⁴¹ simply stitches the lids together in the centre and leaves them for six days.

For *Ectropion*, Benson⁴¹ recommends the Argyll-Robertson method of operation, with the improvement of piercing the lead used as a stay, so that the sutures may be passed through it from within outwards before being carried through the inferior cul-de-sac of the conjunctiva, thus simplifying the operation and keeping the lead in perfect position.

16. *Diseases of the Lachrymal Apparatus*.—Sym⁴⁴ reports a unique case of congenital *displacement of the lachrymal gland*, along the whole length of the upper lid, and by its weight causing almost complete ptosis. Removal and gradual disappearance of the ptosis. Simi⁴⁵ had a case of occlusion of the excretory ducts of the glands by trachomatous inflammation, which resulted in such hypertrophy and severe inflammation of the gland that its extirpation was made necessary. Caudron's case of *double dacryoadenitis*⁴⁶ occurring at menstrual periods is perhaps unique. In view of the excellent nidus for germs in an obstructed lachrymal sac, and especially since Widmark's investigations⁴⁷ concerning the pyogenic germs found in *dacryocystitis*, the recommendation of prolonged antiseptic irrigation in lachrymal suppuration, such, for example, as that made by Mr. Browne,⁴⁸ and by Dr. Mohtanelli,⁴⁵ cannot be out of place. A clinical curiosity is reported by Solomon,⁴¹ consisting of five well-formed *eyelashes* matted together, and *filling the lower canaliculus*. In the treatment of *stricture of the nasal duct* Dr. Starkey⁵⁰ recommends lachrymal bougies, of medicated gelatine, which he says are less painful than metal, and by the use of which, without slitting the canaliculus, together with astringent and antiseptic irrigation, he has had good results. Dr. Steavenson and Mr. Jessop⁴¹ propose a method of treating stricture by passing a metallic probe through the constriction, through which a moderate current from the negative pole of a galvanic battery is passed for a few minutes. The effect is to dilate the channel by the electrolytic

action of the current. The action of the current can be limited to any part of the probe desired.

Mr. Jeaffreson⁷ reports a sorry case of bungling on the part of some unfortunate ophthalmic surgeon, who, in attempting to insert a hollow silver lachrymal *style*, had evidently inserted it in the tissues of the cheek in front of the superior maxillary bone. It had been buried there for fourteen months, producing an abscess and an œdematous, unhealthy condition of the side of the face.

• DISEASES OF THE ORBIT AND SCLEROTIC.

17. The rarity of *gummy tumors of the orbit* is sufficient reason for the report of an interesting case by Dr. Tangeman.¹⁰⁶ The great importance of the proper diagnosis is manifest. The rapid growth, causing extreme protrusion, and other symptoms set forth, led to the prescription of specific treatment, under which the tumor receded. Mraček¹⁰⁷ details six cases of *syphilis of the orbit*, mostly of syphilitic periostitis. The orbital margins are more frequently affected, and, next, the orbital walls. In the latter case its diagnosis is very difficult, and may be mistaken for inflammation of the gland. Panas⁸⁵ extirpated a *serous cyst* that, upon pressure, presented under the plica. Congenital cysts of the orbit are divided by him into two classes,—the true dermoid, and the mucoid. A case of *pulsating exophthalmos* from an injury was cured by Clark⁶² by ligature of the common carotid. (Reference is made to a complete study of this rare disease by Rivington, *Med. Chir. Trans.* lviii. p. 183.) Of 44 cases treated by ligature of the carotid, 16 were cured; 6 benefited; 6 died; 9 were not improved; and 7 cured with loss of vision. Arago¹²¹ records the cure of a case by digital compression of the carotid. Andrews⁵¹ describes the successful removal of two *osteomata of the orbit*, one originating in the frontal, the other in the ethmoid cells. Anatomical and embryological explanations are given of the formation of these growths, whose rarity is shown by the fact that but eight cases occurred in 429,989 cases of eye-disease. Mr. Swanzey's case² of *fibro-sarcoma* was remarkable for its size and the successful results of removal. Professor Zehender's cases of *Echinococcus of the orbit*⁴¹ gives him the opportunity to speak of the peculiar geographical distribution of this strange affection, and the agency of dogs and sheep in propagating it. References may be made to the

hydatid cyst causing proptosis, of Brailey;¹¹⁵ to the lymphangioma of Wiesner;¹⁸ the fibro-sarcoma of Powers;¹⁰⁸ the non-diagnosed tumor of Cross;¹⁰⁹ Bassière's bony tumor;⁶³ Bullard's myxomata;¹¹⁹ Evetzki's cylindroma;¹⁶ Eliasberg's alveolar sarcoma;¹⁶ Licharewsky's dermoid cyst;¹² and Mellinger's cases of phlegmon of the orbit. A case, unique, so far as the reviewer's knowledge goes, is reported by Dr. Gayet.¹¹⁶ Externally there was a series of minute yellowish dots about the corneal margin, unaffected by treatment (ophthalmoscopic examination not given). The intense pain finally led to enucleation, and it was found that the whole posterior portion of the *sclerotic* was *immensely thickened*, and this resulted in compression of the nerves and vessels. Schmeichler's case¹⁷ of *foreign body* adds another to the number of instances of foreign bodies of large size retained in the orbit for a long time without decided symptoms. One is always surprised at these things. In this case a piece of copper, twenty-one millimetres long and eight to twelve millimetres wide, was in the orbit for three months, with no injury to the muscles or displacement of the globe.

A *dermoid cyst of the sclerotic* (with two hairs, length of cilia, growing out of it) was removed by Mr. Dibble.¹¹¹

18. *Affections of the External Ocular Muscles. Convergent Strabismus.*—Its etiology and treatment has, during the year, received its full share of discussion, but by no means more than the subject deserves. In reference to the cause of the squint there has latterly arisen a considerable divergence of opinion. Burnett³⁴ points out the suggestive fact that squint is far less common among negroes than the whites. This, together with the increase among them of myopia, if found to be true in large averages would, as is justly urged, throw a light upon the discussion. The general question resolves itself largely into this: Is the amblyopia of the squinting eye the cause or the effect of the squint? There seems to be a consensus of opinion among the most careful investigators that the view of Donders is in the main the true one. The squint depends upon hyperopia and the interdependence of accommodation and convergence; the amblyopia is the result of disuse, psychological exclusion or suppression. Schweigger is the leader of the opposition; he thinks the amblyopia is monocular and congenital, or that it precedes and is one of the causes of the squint; preponderance of the internal and insufficiency of the external recti are

also powerful factors in the production of the squint. Stilling's position is set forth in Knapp's "Archives," 1886, and according to this view the chief etiological factor is the position of rest or convergence usually associated with hyperopia. According to his statistics the position of rest in the great majority of hyperopes is a position of convergence. Gardiner,⁴³ in combating the views of Stilling, thinks that one eye by excessive convergence actively aids the other to attain and to maintain a tension of accommodation much higher than what its angle of convergence would warrant; this is the generally accepted position of Donders. Mules⁴¹ supports the view "that concomitant convergent squint is the outcome of hyperopia calling on the converging centre by accommodation, before the establishment of binocular fusion." Cuignet¹⁶ comes forward with the strange theory that the child conceals the squinting eye beneath the internal angle, and under the shadows of the nose and brow, because of photophobia; a "reflex," exercised by the defective eye upon the sound one, is also juggled with. In supposing that the commonly accepted theory holds that the deviation takes place in order that the squinting eye may thereby see better, Cuignet sadly misconceives or misrepresents the theory of Donders. It has been urged against this last that, as all children are hyperopes, the connection of squint and hyperopia is not so evident as heretofore supposed. To this there are two answers: there undoubtedly is a difference in different individuals in the connection between, or power of disassociation of accommodation and convergence; some have more "play" in this respect than others, being able to exercise greater accommodation with less convergence; these are therefore able to resist the tendency to squint. But it seemed also necessary to show that the hyperopia in squinting children was greater than in the non-squinting. Mr. Frost⁴¹ finds in his own practice that hyperopia under 1 D., which is common in children, is seldom associated with squint; a majority, however, of his strabismus cases had a refraction of 2 or 3 D., and over 10 per cent. had hyperopia of over 6 D. Mr. Snell's cases averaged over 4.25 D. Mr. Berry⁴¹ regards squint as due, not to an abnormal state of the muscles, but to an abnormal innervation to convergence, "an extension, so to speak, of Donder's theory to its logical sequences." He holds that the amblyopia may be either the cause or the consequence of the squint, or both in one, believing, however,

that the amblyopia as cause is the more common. Mr. Snell's admirable paper¹¹ opening the subject before the British Medical Association gives an excellent *résumé* of the contributions on the subject in later years, and his own careful conclusions command very general assent. Quoting Landolt, he cites the following convincing experiment:—

“If we possess binocular vision let us fix a near object; cover one eye—the left, for instance—and place a concave glass before the right. This will not change its direction, but will continue to see clearly. But the effort of accommodation which it is forced to make in order to neutralize the negative glass imposes itself at the same time on the other eye, and provokes in the latter a convergent strabismus of a degree corresponding to the power of the concave glass. The existence of this strabismus may be easily established objectively, and manifests itself subjectively by a homonymous diplopia at the moment when the diaphragm is removed from in front of the left eye.”

It is certainly a matter of almost every-day experience with practical ophthalmic surgeons that correction of the ametropia is frequently all that is necessary to cure the squint. Patients or their friends notice the reappearance of the squint the moment the glasses are laid aside. As regards the amblyopia of the squinting eye, Frost finds about 5 per cent. of all cases are alternating, and he found no instance of alternating squint where the vision of the non-squinting eye, being normal, that of the squinting eye was less than six-eighteenths. He has had no case in which the vision of the squinting eye has become amblyopic while under observation; and he does not find the average age of amblyopic patients higher than that of the non-amblyopic. The general trend of his conclusions leads to the result that the amblyopia precedes the squint, but that it gets worse with time. From the thorough clinical study of Nettleship²¹ the conclusion is reached that neither of the two main theories, amblyopia from suppression and amblyopia from congenital imperfection of one eye, has yet been fully established. The weight of evidence is in favor of the latter view. It is probable also that the functional association of the two visual centres is not so perfect as is assumed, even in man. Should the existence of one-sided congenital imperfection of hearing or smell ever be verified, the discovery would go far to support the theory that the am-

blyopia of squinting eyes is present at birth, and is not a consequence of the squint. Priestly Smith⁴¹ agrees with Mr. Berry⁴¹ that while amblyopia is frequently antecedent to and productive of squint, there is also an amblyopia essentially depending upon persistent purposive withdrawal of attention from the mental impression received through the squinting eye. Wadsworth,¹⁰⁰ in general, supports the position of Schweigger. From a study of fifty-seven cases of convergent strabismus, eleven divergent and fifteen of congenital monocular amblyopia, he concludes that many now alternating squinters have an equal acuity in both eyes; that when present, the amblyopia is not great; and that as high degrees are found in those not squinting.

Turning to the more practical aspect of the question, *the treatment of squint*, Mr. Carter⁵² does not operate prior to eight years of age if the squint is alternating, and the vision fairly equal in both eyes.

“If the squint be fixed in one eye, and the vision of the squinting eye is good, the same rule should be observed as to the time of operating; but the non-deviating eye should be covered by a patch, say for half an hour every day, so as to compel the other to work and to keep it exercised.

“If the squint be fixed in one eye, and the vision of this eye is *very* defective, so much so that large type cannot be read with it, no visual improvement is to be expected. Only a cosmetic result can be obtained; and, after eight years of age, this can be obtained at any time.

“If the squint be fixed in one eye, and the vision of this eye is slightly defective, it is possibly undergoing deterioration from disuse, and should be carefully exercised, watched, and tested from time to time. If the deterioration appears to be increasing, an operation should be performed without delay, at however early an age. The limit of eight years is, of course, an arbitrary one, but it is roughly coincident with a degree of development of the ocular muscles, and of attention to visual sensations, which combine to promote a favorable result.”

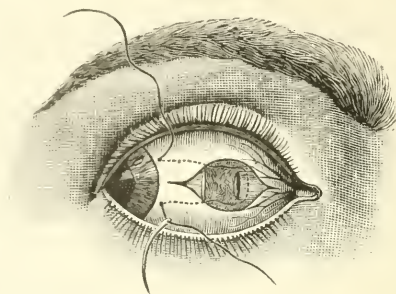
Snell endorses the suggestion of instilling a mydriatic in the good eye, and thus forcing the squinting eye to near work. Cuignet's suggestion of placing a ruler perpendicularly between the eyes when the child is being taught to read makes demands on

both child and teacher that are beyond reason. Snell advises division of both interni, but not at the same sitting, because in 2 per cent. of his last 500 cases there was some subsequent trouble from over-correction. A squint of less than five millimetres will require only a single tenotomy. He does not think it advisable, on grounds of age alone, to defer operation beyond the age of five years. Of methods of exercise for the amblyopic eye, he suggests that the so-called orthopaedic method of treating paralyzed muscles (first advised by Michel, 1877; lately revised by Spalding,⁴³ 1886, and Alt⁴²) be tried in convergent squint. The eyeball, anaesthetized, is simply dragged outward in the line of the external rectus, thus increasing the effect of that muscle and overcoming the tonic contraction of the internus. Mr. Doyne⁴¹ opposed operative treatment except in cases of extreme amblyopia, contending that strabotomy, in the cases of very young children, often produced astigmatism (!). He recommended full correction of the ametropia of the fixing eye and an over-correction of 3 D. of the squinting eye, keeping both under the prolonged influence of atropine. When by this means the squint had been reduced to the alternating variety, the over-correction of the squinting eye was replaced by its true correction, and atropine continued till a cure was completed. The plan will hardly commend itself to the profession. Mr. Hodges⁴¹ urged the correction of the ametropia at an early date,—four years, or earlier still, in some children. In addition the working eye was daily covered with a piece of black cloth for five or ten minutes at a time, so as to exercise the squinting eye. If improvement resulted in three months, he deferred operation. Dr. Landoldt⁴¹ gave most encouraging reports of the results of orthoptic exercises in reducing the amblyopia of squint, and in producing binocular vision after operation. He used *Hering's test for binocular vision* to prove the complete participation of the amblyopic eye in vision. This test consists in making the patient look through a tube directed towards a vertical point placed at a distance of one, two, or three feet from his eyes. Small balls are then dropped either before or behind the point. Only a person possessing perfect binocular vision can tell if the balls drop within or without the point. Illustrative cases are cited from his practice to show that "binocular vision can be reëstablished in cases in which it has been lost for many years, and established where it has never

existed, even when the sight is very defective in one or both eyes; when there exists a considerable difference of refraction and of visual acuteness between the two eyes; and when a certain difference of height seems to be an absolute impediment to the fusion of the two retinal images." It is a matter of some regret that the exact method of conducting the orthoptic exercises is not described. Concerning the technique of *strabismus operations*, Mr. Snell advised the division of the internal rectus from above, because it is "simpler to cut down than to cut up," and also because the operator's position is behind the patient, with the instruments hidden from view, etc. He also thinks the caruncle is more closely associated with the conjunctiva below than above, and that in operation from above there is, therefore, less sinking of the caruncle. To the objection that a kind of pocket is thus made, with a consequently greater ecchymosis possible, a small counter-opening is suggested for the sake of drainage from the dependent portion. Mr. Taylor,⁴¹ at a later date, calls attention to the fact that operation from above was Graefe's method. Taylor prefers operation from above, but first inserts a small hook from below under the lower border of the tendon, causing its extremity to project beyond the upper border, and then cutting upon it so as to divide the attachment to the sclerotic under the small bridge of conjunctiva allowed to remain. Under-correction should be aimed at rather than over-correction. Prince² describes his operation for the advancement of the rectus with the capsule, first offered to the profession in 1881. The object aimed at is, first, to secure an unyielding anterior fixation-point by utilizing the dense episcleral tissue; second, to avoid escape of the muscle by a loop-suture perforating the capsule and conjunctiva; and, thirdly, the formation of a knot to secure precision in the maximum as well as the minimum degrees of deviation and insufficiency, as also subject to modification. From an experience of eighteen cases of *avancement capsulaire*, Myrtle speaks with praise of the method. The manner of procedure being essentially the same as that described more at length by Prince, we copy the shorter description:—

"Two silk sutures are then carried through small bridges of conjunctiva and sub-conjunctival tissue, one millimetre above and below the corneo-sclerotic junction, in the central vertical diameter of the cornea, the upper needle being then passed into the upper

button-hole of the capsule, through the upper border of the tendon, and, finally, emerging through the conjunctiva farther back than the convex margin of the excision, the lower suture passes in the same way through the lower hole, the lower border of the tendon, and issues through the conjunctiva one millimetre below the upper suture. The sutures being now in position, the operator can see by tightening them what result he will gain by the operation, and, if a tenotomy of the opposing muscle is required, it must now be performed, and the sutures finally tied when tenotomy is completed. The amount of correction can be adjusted to a very small degree by means of the amount of traction applied to the sutures in tying them. The sutures are permitted to remain in position for three or four days, when adhesions will have formed, and they can be removed without any fear that the eye will revert to its former position."



WILLIAMS' OPERATION FOR SQUINT.

In operating for *divergent squint*, Williams² (Richard, of England) advances the internal rectus by including the tendon and conjunctiva in a single loop suture before division of the tendon, in the manner shown in the above cut.

Eales¹¹ reports a case where a previous tenotomy had resulted in impaired adduction, abduction, and in divergent strabismus, and where perfect success followed the advancement of three muscles, one external and two internal. Knapp¹⁹ gives the details of a severe suppuration following an ordinary strabismus operation, that may serve as a warning that strict antiseptic measures (doubtless too often neglected) should be used in such cases. As the result of the inflammatory process there was divergent strabismus, finally remedied by an advancement. Dr. Lippincott² calls attention to the existence

of a *localized congestion* of the nasal side of the eyeball, *the result of insufficiency* of the internal recti muscles. Harlan⁵⁴ describes a case of *strabismus* in which the left eye turned *downwards*, cured by a tenotomy of the inferior rectus of the squinting eye, and, later, one of the superior rectus of the other eye. At first the eyelids would not adjust themselves to the positions of the eye. The case was complicated by a high degree of myopia of the right and compound myopic astigmatism of the left eye.

DISEASES OF THE CONJUNCTIVA.

19. *Ophthalmia Neonatorum*.—A unique and remarkable account, in connection with this affection, is given by Legry,⁵⁵ and calls for consideration and substantiation. Three cases of *mammary abscess* are detailed, arising, as Legry believes, from inoculation of the nurse or mother by the discharge from the eyes of the infant suffering from severe ophthalmia neonatorum. Cohn⁵⁷ compares the results of treatment of the developed disease in the infant with those obtained by strict prophylactic treatment as regards the mother during labor, and concludes that the latter is superfluous. As to the *etiology and treatment* of the disease, there is the most complete unanimity of opinion among all the writers of the year. Discharges from the os or vagina gain access to the child's eyes and set up the purulent inflammatory process. The treatment consists simply in clearing away the discharge, and destroying what may be left behind. *Credé's method*, frequent irrigation and instillation of a 2 per cent. solution of nitrate of silver, is most commonly adopted, though a weak solution of corrosive sublimate (one to six-thousand) is also recommended. If, as Cohn says, antiseptics of the birth canal is not necessary, a germicide should be dropped into the eye of every new-born infant immediately upon delivery. As reported by Dr. Eklund, the Swedish Medical Society has promulgated a series of *regulations for midwives*, relating to the prophylaxis and treatment of ophthalmia neonatorum, which are worthy of commendation and imitation. It is but just to notice the report of Dr. Pomeroy,⁵¹ wherein he gives his conviction that a well-nigh fatal *hemorrhage* resulted from the inflammation following a single instillation of a 2 per cent. solution of silver nitrate. The fact may be left in doubt, or its explanation deferred. Compare Schmidt-Rimpler's account⁶¹ of a child of nine months, healthy and without

eyes-disease, that was suddenly and apparently seized with hemorrhage from the conjunctiva of the upper lid: nothing was of avail, and the child died on the tenth day. Mr. Taylor⁷ protects the sound eye, when only a single one is infected, by a shield of simple sticking-plaster. In addition to antiseptis, Heyl¹³ urges the frequent application of hot water as a curative agent. The *results of antiseptis* and prophylaxis in this disease are among the most gratifying in the history of medicine. Careful estimates give the number of blind people in Europe as upwards of 300,000, and from the reports of blind asylums it appears that from 30 to 50 per cent. of the inmates owe their profound misfortune to this, a wholly preventable disease. Dr. J. Lwow-Kasan⁵⁷ reports that in 914 infants treated by the Credé prophylaxis not a single one contracted the affection. Rabinovitch's³⁸ report is of the same tenor. Mr. Girales⁵⁸ describes the loss in the Foundling Hospital of Paris as sometimes 80 to 90 per cent. twenty years ago, whilst to-day it is not far from zero, under the Credé method of treatment.

20. *Spring Catarrh*.—Schmeichler⁵⁹ observes that the exacerbations of this curious affection take place in warm, dry weather, and, conversely, in wet and cold seasons it disappears. It is therefore a disease of spring only in so far as this season is warm and dry. If cool and wet, it does not put in an appearance until summer. This experience concurs with that of Königstein,⁵² who finds in this affection gelatinous exudations at the "limbus" of the eye, and finally extending over the cornea. The palpebral conjunctiva was covered with a thin, milk-like layer of exudation. The disease is very rebellious to treatment, astringents and caustics being without effect. Schmeichler found cocaine gave the greatest relief, though even this was temporary. The symptomatology of this affection with us does not seem to correspond with that given by continental authors. The study and reporting of cases is desirable.

21. *Xerosis of the Conjunctiva*.—Fraenkel and Franke¹⁹ conclude, from their attempts to cultivate the supposed bacillus of Xerophthalmia, that there is no specific germ, but that the micro-organism supposed by other investigators to be such is also found in other types of conjunctival inflammations. This is the conclusion also of Weeks,¹⁹ whose masterly review of the whole subject is very commendable. Weeks finds the disease to be independent of any

encephalitis, as has been supposed, and that it appears only in the anæmic, ill-nourished, or those whose vital powers have been reduced by disease. The prognosis therefore depends wholly on the re-instatement of health and strength; the local treatment is cleanliness, and irrigation with a one to ten-thousand solution of corrosive sublimate.

22. *Pterygium*.—Dr. Theobald⁵¹ urges that the usual theories of the origin of pterygium do not account for its location, and he asks if it may not be explained as due to the influence exerted by use or fatigue of the internal recti muscles over the blood-supply of the conjunctiva covering their insertion. The facts that the interni are more taxed than the others, and that they are in closer relations with the conjunctiva, would point to this explanation as a reasonable one. Lopez¹⁶ combats the theory of Arlt that ascribes ulcer of the cornea as the primary cause, and thinks pterygium and pinguecula are diverse phases of the same malady. In ten cases out of forty-six he found pinguecula of one eye coincident with pterygium of the other, and symmetrically placed. He thinks microorganisms necessary to explain the peculiar characteristics of the disease, but these only occupy the ground after the primary inciting cause—dust, smoke, wind, heat—has produced a localized irritation, generally of the nature of a pinguecula. If trustworthy and sufficiently extensive, Lopez's statistics would negative the suggestion of Theobald. Of 39 cases, 12 were peasants; 7 domestics; 3 sailors; 3 cooks; and only a very few were workers at short range; indeed, but one writer is specifically named as such.

23. *Catarrhal and Purulent Conjunctivitis*.—The studies of Weeks^{25 19} are the most important in this field. Two kinds of microorganisms were found in the conjunctival sac of eyes afflicted with catarrhal conjunctivitis; but one of these, the rod-like variety, showed no pathogenetic quality after cultivation. Inoculation with the other (one to two micro-millimetres long by 0.25 broad), the chain-like variety, not previously described, always produced the characteristic disease; whilst (a noteworthy fact in vivisection) the bacilli themselves were found in the inflammatory products of the induced disease in the eyes of five blind men. The period of incubation was about forty-eight hours. Weeks has studied as many as ten varieties of microbes found in the conjunctival sac. Oldham⁶⁰

has studied the bacteriological origin of purulent ophthalmia, and recommends frequent instillations of the following: Sodium borate, gr. v.; pure carbolic acid, gtt. i.; distilled water, ℥i., followed by application to the lids of the following ointment: Boric acid, gr. xv.; petrolatum, ℥i. Mr. Higgins's treatment⁷ is:

1. Wash away all discharge, and thoroughly cleanse the eyes with a 5 per cent. solution of boracic acid. 2. Apply thoroughly to the whole conjunctival surface, and fill the conjunctival sac with an ointment composed of yellow oxide of mercury (16 grains), boracic acid (20 grains), hydrochlorate of cocaine (from 5 grains to 10 grains), and vaseline (1 ounce); and in some cases also add 2 grains of sulphate of atropine. The ointment may be applied with a camel-hair brush, a quill, a syringe with a good wide canal, or in any way that seems most suitable, so long as care is taken that no part of the conjunctival surface escapes it. 3. Cover the eyes with lint plentifully smeared with the ointment, and bandage them.

This is likewise used in gonorrhœal ophthalmia.

Gifford's researches¹⁹ as to the specific bacteriological origin of *phlyctenular conjunctivitis* are not conclusive, though pyogenic microbes were found in each of nineteen cases. The conclusion is drawn that germicides are necessary in the treatment of the disease. Turnbull⁵⁴ describes *scrofulous ophthalmia* as beginning with a phlyctenula of the conjunctiva, but which close inspection shows to be, not a pustule, but a glandular swelling. It may or may not be accompanied with iritis, but there is always present a coppery red appearance of the inflamed conjunctiva at the limbus, between the cloudy spot and the inflamed gland. Turnbull says this form of disease may happen in tuberculous subjects as well as in the syphilitic. In either case the mercurial treatment is adopted and gradually pushed to salivation, followed by the iodide of potassium.

24. *Trachoma*.—Though the conclusions of Michel have lately been disputed by Kucharsky,²⁷ his bacteriological investigations in 1855-6 are generally regarded as conclusive that trachoma is the product of a specific coccus, which is morphologically a diplococcus of the shape of a double roll, very minute, and with but a slightly developed dividing line. Inoculation of the human conjunctiva produced the typical trachoma. Schmidt⁷ is also said to

have produced the characteristic disease by inoculation of the cultivated coccus of Sattler upon cats and dogs. Kartulis,⁵¹ however, has not succeeded in this. The microscopic specimens of trachomatous conjunctiva of Pollock⁶² are thus described:—

“The adenoid tissue forms distinct spherical masses in the midst of the inflamed, thickened, and infiltrated conjunctiva, the ‘trachoma follicles’ being composed of round lymphoid cells in a delicate reticulum, and having one of two conditions at their margin, either ceasing abruptly without any bounding membrane, or being surrounded with a kind of capsule formed apparently of the condensed connective tissue, which the little growth had pushed aside.”

Alluding to the late attempts to differentiate follicular conjunctivitis and genuine trachoma, Reich⁷¹ contends that though presenting distinctions in symptomatology, we cannot consider the two as distinct. The former is less contagious because less apt to be conveyed from one to another. The differences of opinions or results of different investigators may possibly be explained by the varying virulence of the disease, not only in different countries, but in different individuals. Thus, in 1866, Dr. Sedan,⁶³ after fourteen years’ practice in Algeria, said that, since frequenting the Paris clinics, he had found a *civilized* trachoma amenable to treatment; but that no cure is possible for the types of the disease he had known. Of the contagiousness of the affection, and even its epidemic ravages, there is no doubt. The recent outbreaks in the Norwood schools⁵² and in the Cork work-house⁴¹ are convincing proofs. In the latter schools the number affected averaged from 63 to 80 per cent. In the London pauper schools it is a great trouble. Mr. Stephenson⁴¹ points out the distinction between two classes of cases: (A) Those in which there is a granular condition of the eyelids, but no discharge visible on an ordinary inspection. (B) Those in which there is discharge, catarrhal ophthalmia. Class A is not contagious, or, at any rate, not actively so; but it is extremely prone to be infected by class B. The liability to granular lids is greatly increased by deficient feeding, want of air, and, in fact, by any conditions which act injuriously on the general health. Class B is extremely contagious, and the disease is especially difficult to treat if grafted on preëxisting granular lids. The recommendations as to treatment may be divided into three heads.

1. General: All children on admission should undergo a quarantine of four weeks, so as to guard against the introduction of fresh cases. Attention must be paid to the dietary, and the washing arrangements must be such that several children cannot use the same water or towel. An apparently trivial, but very important, precaution is to stitch the pocket-handkerchiefs to the clothes, so that they cannot be lent. 2. Treatment of class A: These require treatment and regular inspection, to see that they do not become sources of infection. 3. Cases in class B must be strictly isolated and treated. In the Russian army⁴¹ Dr. Talko reports 67.2 per 1000 of the recruits were returned as trachomatous, and in some years the number of recruits affected reaches 10,000. As regards treatment, Dr. Sedan's words⁶³ will command the approval of those who have had an extended experience with this recalcitrant affection: "The treatment of granular ophthalmia is characterized by inequality and inconstancy. I have tried all the classic remedies, including jequirity, to which I owe the loss of two eyes. Cupric sulphate has succeeded for me no better than the rest, though perhaps the best results are derived from it. To be constantly on one's guard against an enemy as dangerous as he is subtle and persistent—such must be our aim at all times."

Mr. C. Bell Taylor⁷ quotes Power as follows: "The diplococcus has its seat inside the trachoma follicles, but outside the cells, not on the surface, but in the follicles of the conjunctiva; hence the method of squeezing, cutting or scratching out the follicles is bacteriologically correct." Taylor thus describes his own treatment: "I scarify the lids, squeeze out the sago-grains; occasionally, but not often, excise the retro-tarsal fold, and apply liquor potassæ, sulphate of copper, or syrup of tannin (nitrate of silver, as a caustic, does not go deep enough), and deal with bad cases by peritomy and inoculation with ophthalmia neonati or gonorrhœa (!), or infusion of paternoster bean." Crushing between the nails and squeezing out the follicles is practiced by Hotz³⁸ and Kramsztyk³⁹. Galezowski⁶⁴ excises the conjunctival cul-de-sac, and reports that out of 600 cases thus treated at his clinic he has had but a single failure. As Armaignac⁶³ says, one has difficulty in explaining such a remarkable success, and, when there is extensive and fully developed granulation, the measure could not possibly have the effect claimed. Armaignac,⁶³ in his excellent critical study, advises among other

things, where the granulations are discrete, the use of the thermo-cautery without opening the grains, and the subsequent instillation of a solution of boric acid, salicylic acid, glycerine and boiling water, in the respective proportions of 8-1-20-200. Collins²¹ thinks pure carbolic acid just liquefied gives as good results as nitrate of silver and sulphate of copper, and that it is preferable on account of the anæsthesia locally produced, as also that it does not stain the conjunctiva like the silver nitrate. Cheatham⁶⁵ advises the use of jequirity, having found it unfailingly successful in his practice. Noyes⁶⁶ cautions against the use of too powerful caustics, which destroy, indeed, the granulations, but which leave bands of cicatricial tissue in the conjunctiva to act as mechanical irritants. These are absorbed only by setting up an artificial inflammation. Manolescu⁶⁷ advises the tenotomy of the superior recti, in certain cases, in order to carry the globe downwards out of the way of the upper lid, and thus prevent the friction-pannus,—a questionable procedure, surely. Wicherkiewicz⁶⁸ commends a powder composed of one part tannic acid and three parts finely triturated boric acid. In severe trachoma the galvano-cautery may precede the powder. Professor Panas⁷² in using the cautery first levels the granulations by the cautery laid on flat, and then he dips the needle deeply at different points, in order to reach the underlying strata of granulations. Quaita⁶⁹ has found corrosive sublimate almost a specific. He uses a one to five hundred solution once daily, applied with a brush, and a one to seven thousand solution several times a day, applied with cloths. He finds the treatment well borne even in corneal implications. Staderini⁷⁰ speaks as highly of this treatment by sublimate, and Luigi¹⁶ and Debenedetti⁴⁵ are quite as enthusiastic. As to the *pannus*, usually considered to be a simple result of the mechanical irritation of the lids, Rähmann¹⁸ strives to show that while the mechanical effects may set up a pannus, the genuine trachoma pannus is a result of the concurrent trachoma infiltration of the corneal structure, and is independent of the lid affection. The contention does not seem to us to be substantiated. Panas⁷² argues for a certain independence of the mechanical irritation in the production of pannus, and finds an etiological factor in the scrofulous diathesis and lowered vitality of most such patients. Vacher⁴⁶ advises replacing the common operation of *Peritomy*, cutting away a circle of conjunctiva, by tracing a furrow about the cornea with

the galvano-cautery. He would burn through the conjunctival and sub-conjunctival tissues to the sclerotic. He says the plan has proved highly successful in his hands.

25. *Epithelioma and Melanotic Tumor of the Conjunctiva.*—Dr. Northrup⁶¹ reports a case of rare primary epithelioma of the conjunctiva, and Mr. Benson⁴¹ had a case (unique?) of melanotic tumor of the same structure. The deeper tissues of the eye were not implicated and the growth had progressed but slowly in five years.

DISEASES OF THE CORNEA.

26. *Bacteriological Studies.*—The results of Burchardt's culture experiments³⁸ are as follow:—

In corneal phlyctenulæ there is present in comparatively small numbers a coccus which very closely corresponds with the coccus flavus desidens of Pflügge. It differs from the coccus pyogenes aureus in being smaller. The small number of the cocci explains why inoculations do not always succeed. It is probable that this coccus is the constant and only cause of phlyctenular conjunctivitis.

Gallenga⁷³ differentiated a coccus that produced superficial infiltration of the cornea when inoculated into healthy corneæ. He also found the same microorganism in the roots of diseased cilia, and thinks such bulbs may be the primary starting-point of the wandering germs. Widmark⁴⁷ separated a staphylococcus which, inoculated into the cornea, produced perforation and destruction of the globe. Hess⁷⁴ describes the absorption of the cocci by the leucocytes of corneal suppuration, and says Descemet's membrane is permeable by the same; whence hypopyon keratitis.

27. *Etiology and Varieties of Keratitis.*—Rampoldi's cases⁶⁹ are of interest in showing how simple venous congestion from a dependent position of the head may produce infiltration of the cornea. In one case, bending of the body forwards and gathering grain from the ground would produce cloudiness of the cornea. In another a dependent position of the head during a few hours' sleep induced a more severe lymph and blood-infiltration, that appeared like thread-like striæ reaching to the centre of the cornea. Dr. Layet⁷⁵ mentions a peculiar form of keratitis to which dredgers are subject, consisting of chronic ulcerations, caused by the continued presence of foreign particles, largely organic, in the eyes.

Trousseau⁷⁶ thinks the hereditary syphilitic origin of interstitial keratitis will soon be firmly established, and he traces⁴⁶ thirty-seven out of forty cases directly to this cause. Haultenhoff,⁶⁴ from a study of seventy-two private cases, concludes that more than one-half were due to hereditary syphilis; five were due to acquired syphilis, and such cases are usually monocular; scrofula and rachitis play no etiological rôle; malnutrition in the young, without specific history, may produce binocular keratitis indistinguishable, so far as clinical features go, from the cases of syphilitic origin. M. Grandmont⁷⁷ distinguishes two varieties of keratitis,—the stellate, consisting of minute sub-epithelial ulcerations, arranged, in the transitory initiatory stage, in the shape of five to six branched stars; and the trabecular variety, resulting from an infiltration of the corneal tubules by lymphatic cellules, and caused by impeded lymphatic circulation. Hagen-Thorn⁷⁸ finds syphilitic keratitis appearing under four typical forms,—superficial, in hereditary syphilitics, and characterized by roughness of the epithelium; superficial hypertrophic, or pannous, a slightly vascular affection, with a central elevated spot; interstitial macular, with spots in the corneal parenchyma; and the vascular, in the young syphilitic, from heredity, in the adult, from acquired. Poncet,⁴⁶ Javal,⁴⁶ Sedan,¹⁶ and others are emphatic in ascribing malaria as a considerable factor in the etiology of interstitial keratitis. Ayres¹² describes three cases of bullous keratitis occurring in his practice, and reviews the literature of this variety. Phillips⁷ had a case of multiple minute ulcers of the cornea from exposure to electric light.

28. *Treatment of Keratitis and Corneal Ulcers.*—When syphilis is found to lie behind the corneal disturbance there is, of course, no question as to the constitutional treatment. Those recognizing the malarial factor (Sedan and others) find great benefit from antifebrile and tonic medication. Mr. Teale¹⁴⁰ advises treating cases of strumous ophthalmia with photophobia, by scraping and so forth, as follows:—

“Any trace of ulceration on the cornea or its margin, or any visible granulation on the cornea, or any pustule on the conjunctiva is scraped bare by the delicate eye-scraper. The cornea, lids, and conjunctival sac are thoroughly cleansed of all trace of secretion by washing with a weak solution of carbolic acid (one in one

hundred), and the cornea and conjunctival sac are dredged with iodoform. If the intolerance of light has been excessive, it is well as a next step to paint the skin of the eyelids and eyebrows with solid nitrate of silver. The skin having been moistened with a sponge, the solid nitrate is rubbed once over the surface. A further dredging with iodoform, and the application of the cotton-wool pad, eased with a broad strap of plaster, completes the dressing. As a rule the dressing need not be disturbed for many days; and on its removal I usually find the intolerance of light gone, the patient in comfort and thriving, with, perhaps, a healing, non-irritable ulcer, which as a rule needs no further treatment beyond a drop of solution of atropine twice or thrice daily until all is healed."

Mules⁷ arrested a deep crescentic ulcer of the cornea (with splitting of the corneal layers so great as to allow the passage of a probe) by scraping and iodoform. In a corneal ulcer in a patient suffering from Grave's disease, the lids were united over four-fifths of their length. Grandmont,¹⁶ in hypopyon keratitis, splits the cornea across, evacuates the pus, and washes out the anterior chamber with $\frac{1}{2000}$ mercuric iodide solution, by means of a syringe. Baths of bichloride, $\frac{1}{2000}$, are applied by means of a reservoir eye-cup. Thompson⁷⁹ recommends duboisia as not only preferable to atropia in acute interstitial keratitis, as a mydriatic, etc., but thinks it limits the course and severity of the disease. Burchardt³⁸ says the cocci of phlyctenular keratitis can be got rid of best by the galvano-cautery, after which irrigation with boric acid solution and calomel insufflation. Dehenne⁷² finds dacryocystitis present in 9 out of 10 cases of serpiginous corneal ulcers, and believes that it is the almost unique cause of the ulcer. He therefore applies himself first to the relief of the lachrymal trouble by slitting the canaliculi, and catheterizing and irrigating the passages.

If there is no pus in the anterior chamber, the ulcer is touched at all points with the thermo-cautery. If hypopyon exists, the cautery is thrust into the anterior chamber, the opening enlarged, the contents of the chamber evacuated. Eserine and an ointment of sublimate are used. Abadie⁷⁷ practices injection of the bichloride in parenchymatous keratitis. Smith⁸⁰ speaks enthusiastically of the induction of jequirity inflammation in ulcers and abscesses of the cornea. In perforation of the cornea with prolapse of the iris,

Gama Pinto³⁸ hastens the corneal cicatrization after cutting off the prolapsed iris, by laying a piece of freshly excised conjunctiva upon the face of the wound, surface downward, and then gently pushing it like a plug into the lips of the opening. A writer (?) in the *St. Louis Medical and Surgical Journal* combats Meyer's recommendation of eserine and pilocarpine in ulceration; he thinks they increase the pain, and that atropia is preferable. Schilling⁸¹ has found iodoform of the greatest benefit in deep serpiginous ulcers. Hotz⁸² uses frequent irrigation with a one to five thousand solution corrosive sublimate in hypopyon keratitis. Gruening⁸³ makes a practical suggestion: in view of the fact that every one may not have a cantery battery at hand, a platinum probe heated in the flame of a Bunsen burner may be made to serve the purpose very well.

29. *Leucoma of the Cornea*.—Mr. Gunn⁷ gives the details of a case of calcareous film of the cornea, in a blacksmith exposed to blasts of cold air and great heat. There was no history of gout or rheumatism, and no concurrent iritis or keratitis. He proposed scraping it away. Bock⁸⁴ describes the microscopical examination of three cases of band-like, calcareous opacities of the cornea, showing the chalk deposits in the membrane of Bowman and sub-epithelial structures. There is also an epitome of the literature of the subject. He considers the phenomena to be results of affections of the uveal tract that end in abnormal relations of the aqueous and vitreous. Mr. Snell⁴¹ advises massage, first proposed by Pagenstecher in 1872, to hasten the disappearance of corneal opacities. The method of procedure is to lubricate the inner surface of the lid, and then, laying the pulp of the finger on the lid, move this to and fro over the globe in directions radiating from the centre of the cornea. Repeat for a minute once daily. The treatment is very protracted, but is generally productive of distinct, often of great, improvement. Hogg⁵² found the persistent administration of turpentine internally led to disappearance of corneal opacities. Danziger¹⁸ advised, some years ago, to precede the massage by scraping away the opaque corneal tissue, and the employment of massage during cicatrization. Vaqueur⁷⁴ has noticed opalescent striæ of the cornea after cataract and iridectomy operations, that proceed from the wound to the centre of the cornea. Microscopical examination of a case showed an infiltration of lymph and hyaline cells and atrophy of the fundamental corneal substance.

Beselin⁴³ presents a case, the second recorded, of true amyloid degeneration of the cornea, limited to that structure. It did not originate in the cells, but was a genuine amyloid imbibition of connective tissue. From Despagne's (unfinished) articles¹⁶ we gather that in Galezowski's clinique of 1884 there were 304 leucomata or adherent staphylomata out of 9522 cases. Vacher⁴⁶ extends the method of *tattooing the cornea* to an imitation of the colorings of the iris by the use of multicolored pigments, instead, as heretofore, by India ink alone. Hirschberg²⁷ describes his manner of tattooing, and appends an historical glance at the subject. The article of Neese,¹⁸ on the method of *healing of corneal wounds* made with the knife, shows a dipping down of the epithelial cells into the lips until the surfaces are covered; then they fill the cavity with their proliferations. The karyokinetic process is shared by the whole cornea, but it is most active about the wound. On the fourth day the epithelial proliferation begins to be extruded by the new-formed connective tissue, and degeneration of the superfluous cells about the sixth day. On the ninth day of an extraction wound (human) more than two-thirds of the wound had been closed by epithelium.

30. *Conical Cornea*.—Mr. Cowell⁷ treats keratoconus by transverse, instead of vertical, incision, with excellent results. McHardy⁷ trephines and removes an elliptical flap. Critchett⁷ finds anterior synechia present in 50 per cent. of cases, and an iridectomy is therefore necessary. He began with a minute vertical iridectomy, and ten days later another iridectomy outwards, followed by the removal of an elliptical portion of the cornea. Dr. Tatsuya, of Tôkyô, Japan, performs paracentesis of the cornea in staphyloma, followed by a pressure bandage, and reopening the wound several times to admit of escape of the aqueous. Cant⁴¹ praises the operation first devised by Andrew, of Shrewsbury, as far superior to any previous method:—

With a very fine needle cautery highly heated, a minute opening is easily made through the apex of the cone; this permits a continuous escape of the aqueous for from seven to fourteen days, giving rest and time for the weakened cornea to contract to its normal curvature, the well-known contractile power of a burn adding greatly to this.

No anæsthetic except cocaine is necessary, there being pain

neither during nor after the operation. It is necessary that the pupil be thoroughly dilated with atropine before commencing to operate. No speculum should be used, and no pressure put on the eye during the operation, an assistant gently raising the upper lid. Directly the cautery has penetrated the cornea it must be removed, the eyelids closed and not opened again for three days, a little castor-oil with atropine being gently rubbed along the lashes every morning, and the wool pad readjusted.

The advantages claimed for the operation are: (1) it is easily performed; (2) there is no risk of anterior synechia; (3) the slow and continuous drainage of the anterior chamber allows rest and contraction of the cornea; (4) the cauterized opening in the cornea leads to further contraction; (5) the scar is a small one.

Instead of excising a crescent-shaped piece of the cornea, Abadie⁸⁵ cauterizes a similarly-shaped portion, thus avoiding opening the anterior chamber. Petresco⁸⁶ recommends as the best treatment that practiced by Panas,—continuous compression, myotics, and, in certain cases, the application of the cautery to the summit of the cone. Pincus⁸⁷ relates a case of congenital staphyloma of the cornea, which must have been the result of an intra-uterine keratitis during the second half of pregnancy. Guiot⁸⁶ advises a line of cauterization two millimetres from the border, in the upper part of the cornea, so the cicatrice will be hidden by the lid. *Transplantation* is performed by Von Hippel with a degree of success that is very encouraging. The promising case of 1886, giving the patient V. $\frac{2}{200}$, has been followed by another, a woman of 50, in whom there has also been a decided increase of visual acuity.²⁷ Hippel proceeds from the demonstration of Leber, that any breach of continuity of Descemets' membrane is followed by a disorganizing action of the aqueous upon the overlying parenchyma of the cornea. He consequently removes a button of the opaque cornea, leaving Descemets' membrane intact, and, with the same trephine, a button from the whole thickness of the rabbit's cornea is excised and laid in the wound. It is needless to add that the whole operation is carried out under strict antiseptic conditions. The bandages are laid aside in thirteen days. Adamuk⁶⁸ considers the preservation of Descemets' membrane of less importance than the preservation of some portion of the neighboring sclerotic, whence the cornea draws its nourishment. He there-

fore in transplantation excises a portion some two millimetres wide, and inserts this into the wound of similar shape and size. Rats' eyes were first used, followed by sloughing and failure. Fowls' eyes were then tried, and only two out of five cases were followed by suppuration. The osseous scleral portions (from the fowl's eye) were, in the successful cases, eliminated spontaneously in minute fragments. The transparency of the transplanted cornea in the three cases is said to have been preserved, but we are not told with what result as regards vision. Revelli⁸⁸ failed to get any satisfactory result in thirteen transplantation operations. Martin³⁸ proposes division of one rectus and advancement of the opposite, so as to rotate the globe through about 45°. A gold canula is then inserted into the sclerotic, and the conjunctiva united over it, until inflammation has subsided, when the conjunctiva over the canula is destroyed by cauterization and a glass stopper is inserted to refract the light. Comment seems unnecessary!

31. *Sundry Affections of the Cornea*.—Mr. Benson² details a case of *fibroma* of the cornea, recurring after an excision three months previous. It was composed of corneal tissue, opaque, non-vascular, and is noteworthy as being a rare instance of such a growth engaging the corneal structure alone. Panas⁸⁹ reports the removal, by ablation and cauterization, of a *melano-sarcoma* from the centre of the cornea, with no recurrence in thirteen months. Reid⁶² removed a *xeroderma pigmentosa* from the superficial layers of the cornea. Similar nodules existed in the skin of the face and hands. Story showed a case of *dermoid tumor* of the corneo-scleral margin, with one long hair growing from its centre. It had been quiescent from birth (middle-aged man) until of late it had begun to extend over the cornea. Galezowski¹⁶ describes two instances of *hemorrhage* of the cornea easily mistaken for hyphæmia. Dujardin⁴⁶ had a patient with an eyelash in the anterior chamber, the result of traumatism.

DISEASES OF THE IRIS.

32. *Iritis*.—Dehenné⁷² seems to find it necessary to speak strongly against the use of astringents in iritis. Beyond the routine treatment he finds pilocarpine a useful adjuvant in chronic cases of syphilitic iritis. Hogg⁵² cites a case where the persistent use of turpentine (in half drachm doses, *t. d.*) for four months pro-

duced a relief and finally a cure that had been vainly sought by many other drugs. Mr. Nettleship⁴¹ thinks that in recurrent iritis an iridectomy in selected cases is to be commended, but that it should not be done until a patient trial of other means has shown them powerless. In cases of complete adhesion forming circular synechia, iridectomy is advisable. Mr. J. Hutchinson, Jr.,⁴¹ emphasizes the frequent occurrence of *quiet iritis*. From a study of thirty-seven cases he deduces the following conclusions:—

1. Sympathetic inflammation, congenital syphilis, and inherited arthritic (gouty or rheumatic) tendency are probably the most frequent causes of quiet iritis.
2. This form is very rare in the iritis of acquired syphilis, that of the ordinary rheumatic type, and in traumatic or herpetic iritis.
3. Sex and age have little or no influence in modifying the severity of the symptoms accompanying iritis.
4. That a constitutional tendency cannot always be invoked as the reason for iritis taking on an insidious form is shown by the occasional occurrence of two attacks in the same patient, one being accompanied by violent inflammatory symptoms, the other perfectly quiet throughout.
5. The absence of the ordinary symptoms of iritis by no means always implies a mild course of the disease, some of the cases going on to complete blindness of the affected eye.

Chilton,⁹² besides mydriatics, etc., thinks the most beneficial of all local treatment in iritis is hot water applied for fifteen minutes every hour till the pain is relieved. He alludes to the frequent occurrence in the South of *Malarial Iritis*, of which quinine (with purgatives) soon serves to cut short the attack. Schweigger¹⁹ points out that in interstitial keratitis of a severe type the anterior chamber may become so shallow and the swelling of the iris so great that, *without perforation*, the iris may be brought in contact with Descemet's membrane, and anterior synechia result.

33. *Surgery of the Iris*.—Allusion has already been made to Pinto's⁶⁸ method of treating prolapsed iris by plugging the perforation with a piece of conjunctiva. Keyser,¹² in posterior synechia, does not perform iridectomy when the centre of the capsule is transparent. Weber's hook he thinks too large, and he uses instead a delicately modified hook, entered through a small open-

ing, with as little loss of aqueous as possible. Vincentiis,⁶⁹ in iridectomy operations, withdraws the iris from the wound, pierces the periphery with a Graefe knife, continues the cut up to the sphincter, held by the forceps, which are then opened for the knife to complete the iridectomy.

34. *Sundry Affections of the Iris.*—We have already alluded to the case of Turnbull,²⁵ in which a *persistent pupillary membrane* arose as if by an extension of the anterior layers of the iris. Schiess-Gemuseus⁶⁸ details an interesting case of *bilateral congenital coloboma* of the iris and lids. There was also cleft palate, etc. Werner² reports two cases of *iridodialysis*, or tearing of the iris from its ciliary attachment, as a result of confusion of the globe. In the first case there followed complete reunion of the detached portion under atropine and bandage treatment. In the other case there was ante-version (uveal surface forwards) of the iris, which finally led to enucleation. Galezowski¹⁶ has now had three cases of *total detachment of the iris*, with its complete disappearance, twice from glaucomatous affections, and once (the last) from traumatism. In the traumatic case there was slight cyclitis and hyphæma, no change of density or of the papilla, and recovery of vision was perfect after the absorption of the cataract. It is indeed remarkable that such an injury could happen without more serious sequelæ. Rumschewitsch⁴² had a case of *double pupil*, the second and smaller showing passive movements synchronously with the activity of the normal pupil. Chase¹² removed a *cyst of the iris* by making a double iridectomy, leaving the cyst between the two coloboma, which was then excised. Reuling⁴³ removed a cyst 7.5 millimetres by 4.2 millimetres by a broad iridectomy, and afterwards cauterized the matrix with caustic stick. But there was a recurrence a year later; this was again removed and all probably invaded tissue burned with the galvano-cautery. No recurrence in fourteen months. Professor Fuchs⁹³ showed two cases of the rare *melanotic sarcoma* of the iris. A case of solitary gummous tumor of the iris simulating sarcoma was entirely dispersed by Mules⁷ with mercurial inunctions. Professor Sattler⁹³ had two cases of *congenital ectopia* (displacement) of the pupil and of the lens. The pupil was outwards and downwards, the lens inwards and upwards. Goldzieher⁹³ had a case of *melanotic sarcoma of the ciliary body* that necessitated enucleation.

DISEASES OF THE CHOROID.

35. *Choroiditis*.—Mr. Hutchinson's address⁴¹ was designed to answer the question as to the degree of confidence with which one might rely on the existence of old changes in the choroid, patches of absorption and pigment accumulation, as symptomatic of syphilis. The conclusions reached are summed up in the following distinctions:—

1. That concussion of the eyeball might produce conditions closely resembling those of other forms of choroiditis, but always limited to the eye injured.

2. That choroiditis disseminata, affecting both eyes, was occasionally met with as a family disease, independently of syphilis, and in association with disorders of the nervous system, especially of the intellect.

3. That there were cases of choroiditis which occurred in fairly healthy persons, which showed a remarkable tendency to recurrence, which were accompanied by iritis, and ought possibly to be grouped with relapsing cyclitis.

4. That young men were liable to a peculiar form of hemorrhagic choroiditis which was not dependent upon syphilis, but which produced results not to be distinguished from the syphilitic forms.

5. That there were yet other forms of disseminated choroiditis which could not be assigned to any of the above groups, but which closely resembled in their final results what we observed in syphilis, but in which there was still no reason to suspect that disease.

Thus, whilst it was to be freely admitted that, in nine cases out of ten, the discovery of the results of choroiditis disseminata amounted to the discovery of antecedent syphilis, the symptom was yet one which must be received with caution, and could be trusted only when it was supported by other facts.

A photograph of a case of choroiditis in a young lady was shown where there was not the slightest evidence of syphilis besides the choroiditis, and the father's volunteered statement that he had at one time had the disease was the only reason for believing the choroiditis to be of specific origin. The choroidal changes were recent, and consisted in little elevated dots of exudation, with no large patches and scarcely any disturbance of pigment. They

speedily disappeared under specific treatment. Mr. Browne⁴¹ was inclined to think choroiditis undoubtedly existed in patients not suffering from syphilis, hereditary or acquired. He thought choroiditis often one of the results of the growing period of the eyeball, of which results myopia and myopic astigmatism were also to be noted, and that there was also frequently concurrent cerebral troubles, all of which had no relations with syphilis. Mr. Hutchinson⁴¹ said that symmetry or asymmetry could not be relied on to indicate the constitutional or local origin of the choroiditis. As a rule, of course, the disease if syphilitic is binocular; but one eye is frequently more severely affected than the other, and one eye might be attacked alone, not to be followed by the implication of the other eye for a time, even years. As to the treatment there should be no doubt, because of the fact that some cases might be of non-syphilitic origin. The specific treatment should be instituted in all cases, chronic or acute.

Improvement under specific treatment proves Armaignac's case⁹⁴ of areolar choroiditis without other syphilitic signs to have been of syphilitic origin. Gayet's case⁸⁵ of panophthalmitis was due to the staphylococcus aureus, and led to enucleation of the eye, after which there was a speedy recovery from the severe constitutional symptoms previously existing. The direct cause of the ocular inflammation was traced to the extraction of a tooth and the resultant inflammation of the upper jaw, which extended itself to the eye and was followed by increasing amblyopia, and, finally, blindness. Up to the time of the dental trouble there had been no febrile or constitutional symptoms. In this connection the reviewer cannot forbear reference to Tweedy's view of the preference of syphilis for mesoblastic tissues (see § 5), and query what part the coccus played and what part the possible syphilis, which is not alluded to by Gayet. Gilmore's case⁵¹ of acute irido-cyclitis without recognizable cause was completely relieved by Badal's operation (nasal branch of the trigeminus). Mr. Brailey's case⁴¹ of successively occurring isolated spots of choroido-retinitis affecting the yellow spot of one eye, was complicated by a coexisting compound hyperopic astigmatism of the same, and glaucoma absolutum of the other eye, of twenty-years' duration. As the small, rounded, isolated spots seen by the ophthalmoscope, of dull grayish color, faded, there was almost perfect restoration of vision. Whilst the spots were recent the scotomata

were varyingly pronounced and troublesome. Treatment not given. Goldzieher⁹⁵ judges from a merely theoretical study (without histological investigation) that Hutchinson's cases (1886) of symmetrical chorio-retinal disease occurring in senile persons were not cases of choroidal implication, but that they were due to disease of the retinal arteries, with blocking of the arterioles of the macula and resultant spots of softening. His conclusions do not seem to us conclusive.

36. *Neoplasms of the Choroid*.—Dehenne's case⁷² of sarcoma of the choroid was diagnosticated by detachment of the retina without known cause, and by the presence of new-formed blood-vessels. A prompt enucleation obviated probable glaucomatous or other baneful results. Grandmont's⁹⁶ case showed a total ossification of the choroid, the result of a sarcoma. He diagnosticates sarcoma by persistent circumorbital pain, the detached retina and its grayish tint, and the vague recognition of vessels not moving with the movements of the retina. Panas⁹⁷ reports a case where capsular cataract made the diagnosis of sarcoma very difficult. In such cases he relies greatly on the sign of increased hardness and resistance. Bassières et Rochon-Duvignaud⁶³ give the details of a case of osteoma of the choroid, resulting from traumatism. They describe the osseous layers as constituted of veritable osseous tissue, Haversian canals, with concentric lamellæ, etc. The vessels of the canals were sometimes continuous with those of the choroid. Mr. Lawford's report²¹ of 19 cases of sarcoma excised at Moorfield's, 1884–1887, is of exceptional value. These happened in 14 males and 5 females of an average age of 51. The youngest case was 33, the oldest 70. There was recurrence in 2 cases, possibly in one or two others; but in all the others there was none, though the longest interval without recurrence is but two years. There was a family history of "tumor" in 2–3 cases, a perfectly good family history in 4, no history obtained in the balance. In 4–5 cases the sarcoma originated in eyes previously blind from other causes. In 5 cases there was a history of injury, but a long time previously. In 11 cases ocular tension was increased, in 5 it was normal, in 1 doubtful, and 2 were shrunken eyeballs. In one case of shrunken eyeball, sympathetic ophthalmitis of the other eye was set up, running a slow but disastrous course. One case was a sarcoma of the ciliary body following trauma, without choroidal, retinal or corneal implication, but with opaque lens. In one instance the

lens was slightly invaded, in 7 the sclerotic, in 3 the optic nerve. In most cases the growth was pigmented; in one it was not at all so.

DISEASES OF THE LENS.

37. *Etiology of Cataract.*—The artificial production of cataract in animals has occupied the attention of several investigators. Bouehard in 1886 first discovered that the ingestion of naphthaline by rabbits resulted in opacification of the lens; and Dor,⁴⁶ repeating these experiments on guinea-pigs and rabbits, found the former were not affected by the naphthaline, and that in rabbits the cataract was not the sole or primary lesion, but that the retina, choroid, etc., were the seats of the deposit of whitish spots of leucocytes, the same as in the lens. Panas⁴⁶ confirms the experiments of Dor, and notes the existence, in the vitreous and elsewhere, of crystalline bodies, but which were not composed of sulpho-naphthol. These facts seem to point to a dystrophic rather than a chemical change governing the formation of cataract, and Panas' dictum is that there is no cataract without extraocular lesion, and these two series of changes are of parallel progress. The immediate cause he considers a nutritive disturbance, proceeding from an interruption or perversion of the currents from the retina and optic nerve across the vitreous, upon which the vitality of the lens depends. The same cause explains the production of the cataract of albuminuria. Stein²⁷ produced cataract in guinea-pigs by the persistent action of sonorous vibrations.

Of the pathological causes of human cataract Schoen¹⁸ looks upon accommodation strain as by all odds the most prolific source. This conception of the matter strikes us as worthy of the most serious consideration, since the immense importance of accommodation strain, not only upon the eye, but upon the general nervous system, is a fact that even the ophthalmological profession seems a long time in realizing. Schoen's thesis is that the effort of the accommodative apparatus of the eye to neutralize the defects of the refractive apparatus leads to unequal tension on the anterior leaflet of the zonula, whence result folding and malnutrition, and, finally, opacification (by inflammatory migration of leucocytes?). On the other hand, the same tension produces the accommodative excavations of ametropia, 80 per cent. of the patients subjected to the strain showing the excavation. Of 95 cases of equatorial cataract, 92

showed the excavation, and of the 95, 39 were astigmatic, 39 hyperopic, 11 presbyopic, and of 4 the refraction was undetermined. Thus nearly 100 per cent. showed uncorrected ametropia. There was no case of nuclear opacity without coexisting equatorial cataract, and 90 cases of the latter without nuclear sclerosis; thus showing the equator to be the starting-point of the mischief. This coincides with the theory that the strain is shown on the zonula leaflet; whence hypertrophy of the capsular epithelial structure, etc., etc. The notable fact that cataract is preëminently a disease of those advanced in life accords with the fact that at this period presbyopia is added to any preëxisting strain, or is of itself a sufficient source of strain to cause great trouble. Besides all this, any lesion of transparency, extremely fine work, wearing too strong or non-correcting spectacles, etc., etc., may produce strain. Gonella⁶⁹ noticed in five cases of diffuse retinitis of syphilitic origin, punctate opacities of the capsule in the equatorial region, which he ascribed to malnutrition consequent upon the retinal affection. Treatment resulted in lessening the number of the spots. A writer (?) in the *St. Louis Medical and Surgical Journal* reports a case of congenital pyramidal cataract of both eyes that gave a remarkable history of hereditary transmission of this defect. The patient stated that several generations were thus afflicted. The father had the same spots, one brother, two sisters, and all three of his own children. (Was the corneal inflammation intrauterine,—since all the above cases were reported as congenital,—or must the theory of a perforating ulcer of the cornea, etc., be abandoned?) Lawford² gives the details of two cases of concussion cataract where examination of the removed eyes enabled him to prove the existence of a capsular rent. This is a contribution towards a settlement of the disputed question of a rupture of the capsule being a prerequisite of traumatic cataract. An interesting statement of the origin of lamellar cataract is suggested by Beselin's description¹⁹ of the examination of a lens of this character. The conclusion is that, analogous with the theory of Becker as to senile cataract, a chemical change of the later lens-nucleus is at the bottom of the process, caused by a period of malnutrition during the time of the development of the lens, and at a time when the entire lens consisted of this nucleus.

This change was followed by a gradual shrinking of the lens-substance, which led to the fissures or hiatuses (characteristic in the

example examined) between the earlier lens nucleus and the layers subsequently superposed. These vacuoles become the lodging places of myelin drops and "detritus," which thus press the fibres apart and make the incipient cataract, and further disturb nutrition of the layers. Deutschmann's report¹⁸ is of a similar character.

38. *Ectopia and Luxation of the Lens.*—Sattler's case⁹⁵ of congenitally displaced lens illustrates a frequent condition of this anomaly, viz., that the ectopia of the pupil and of the lens are not at the same, but opposite sides. Montagnon⁸⁵ describes a case of traumatic luxation in which the lens was found below the capsule of Tenon, outside of the sclerotic, between the tendons of the external and superior recti. Critchett⁴¹ describes the dextrous expedients taken in the extraction of three dislocated lenses. Thompson's report³⁴ of thirteen cases of displacement is valuable. He thinks the most fruitful cause of spontaneous luxation is subacute inflammation of the uveal tract, and does not doubt that it is often the cause of the acquired myopia ("second-sight") of elderly people. It is also thought that heredity plays an important part, that it is a dangerous anomaly, prone to progressive luxation, cataract and glaucoma. The myopia is, of course, due to the malposition of the lens. Mr. Lawford's report²¹ of five cases of dislocation suggests interesting points: the blocking of the iris-angle, in one case, interfering with free drainage, resulted in forcing the iris against the cornea to which it became adherent. Glaucoma and retinal hemorrhages followed. These destructive changes were under way in another case, but were cut short by enucleation fourteen days after the injury, when already iritic adhesions had taken place. The third case was a dislocation into the vitreous during a fit of coughing; no symptoms for twelve years. There were no iritic adhesions, though a noticeable cell-aggregation in the meshes of the ligamentum pectinatum and about Schlemm's canal. Increased tension, pain, etc., were present. In Case V. there was a total rupture of the ciliary body from the sclerotic, and the lens lay in the pocket between the ciliary body and sclerotic, slightly projecting into the anterior chamber.

39. *Spontaneous Absorption of Senile Cataract.*—It has been a debatable question whether or not this absorption took place. Meyer,¹⁸ in a review of the literature, inclines to the belief that too many cases have been reported to leave the matter longer *sub*

judice. Kipp¹² gives the details of a case about which there would seem to be no question, and the fact of the preservation of the capsule intact is worthy of mention.

40. *Cataract Extraction*.—The question which at the present time every ophthalmic surgeon has to settle is whether in cataract extractions he shall or not perform an iridectomy. Knapp's⁴³ conclusion is as follows concerning the operation without iridectomy:—

“*Simple Extraction* is an operation of the highest order, and practicable in the majority of cases with the same degree of safety as the extraction combined with iridectomy. In a considerable minority of cases, however, the latter method is preferable. In a number of cases the indications for the iridectomy manifest themselves before, in others only during the operation.” He says an iridectomy should be made in the following instances:—

1. When, in case of fluidity of the vitreous and rupture of the suspensory ligament of the lens, the cataract on pressure does not present in the wound, but only vitreous escapes.

2. When the section is insufficient and the iris, in the attempt to expel the lens, has been pushed into the wound, and vitreous presents or escapes.

3. When during the operation the iris has been bruised or injured.

4. When the sphincter is unyielding, more especially when a peripheric piece of the iris, falling before the knife, has been exsected. I would rather cut a rigid sphincter than expose the patient to prolapse of vitreous in the attempt to overcome its contraction by undue pressure.

5. When the iris, after the expulsion of the lens and cleansing of the pupillary field, proves irreducible.

The advantages of not making an iridectomy are, in successful results, thus enumerated by Knapp:—

1. It preserves the natural appearance of the eye.

2. The acuteness of vision, other things being equal, is greater.

3. Eccentric vision and “orientation” (correct localization of objects in the visual field) are much better, adding a great deal to the comfort and safety of the patient.

4. Parts in direct connection with the ciliary body, such as shreds of the capsule and iris, are not so liable to be locked up in

the wound, and thus transmit morbid conditions to the most vulnerable part of the eye,—the ciliary body.

5. It may not necessitate so many after-operations.

As *disadvantages* may be mentioned:—

1. The technique of the operation is more difficult in all its parts: (*a*) The section must be larger, to let the lens pass through an aperture, the size of which is diminished by the iris lying in it; it must be more accurate to secure coaptation, and it must be more rapidly performed in order to prevent the iris from falling before the knife. (*b*) The opening of the capsule requires a deeper introduction of the cystotome into the anterior chamber. (*c*) The expulsion of the lens is more difficult, and (*d*) the cleansing of the pupillary area is much more troublesome than in the combined extraction.

2. Prolapse of iris and posterior synechiæ are more numerous.

3. It requires a quieter and more manageable patient during and after the operation than is needed in the combined extraction.

4. It is not applicable to all patients; whereas combined extraction can be used as a general method.

Knapp's conclusions as given above are based upon 29 operations in which the lens was extracted without iridectomy, and 6 attempts to do so without success. Out of the 29 there were 18 perfect or ideal successes, *i. e.*, 66 per cent. "Ideal recoveries" are those in which the pupillary area is not obstructed by inflammatory products, the pupil central and movable. There was one case of loss. The imperfect results were unimportant, such, *e. g.*, as oval or displaced pupil, and capsular obstruction requiring, as is frequently the case, a subsequent discission operation. The visual acuteness obtained was: $\frac{2}{20}$, 2 cases; $\frac{2}{30}$, 3; $\frac{2}{40}$, 4; $\frac{2}{50}$, 3; $\frac{2}{70}$, 5; $\frac{2}{100}$, 6; $\frac{2}{60}$, 1; $\frac{1}{50}$, 1; $\frac{1}{60}$, 1; $\frac{8}{200}$, 1; $\frac{6}{200}$, 1; 0-1. Manolescu¹² had trouble in simple operations from prolapse of the iris and other complications due to the difficulty of cleaning out the chamber, and he therefore holds the combined as the more reliable operation, as it lowers the danger from retained matters and iritic complications. He removes the anterior capsule with toothed forceps. Coppez,⁴⁶ with the combined operation, lost 5 per cent. of eyes, with the simple 3.36 per cent. Landolt¹² favors the combined operation, thinking it better to seek a fair degree of useful vision rather than a symmetrical pupil. Dr. Abadie¹² reserves the operation for cases that

are healthy, fully ripe, and promise ease of extraction, etc. Dr. Marmion¹² uses only the combined. Mr. Powers¹² is converted to the simple operative method. Cocaine has rendered accidents less likely. Iridectomy is no protection against iritis. Secondary cataract occurs as often in one method as the other. Dr. Reynolds¹² advises the simple extraction in selected cases. Baker¹² does an iridectomy, while Burnett¹² never does. Dr. Valk¹² uses a peculiar retracting forceps for tucking the iris back out of the way, and delivers the lens over the arms of the forceps,—of course without iridectomy. He says no iritis follows, and he secures a round pupil. Dr. Williams¹⁰⁰ compares his results by the two methods, much to the advantage of the simple extraction, and Coppez⁷ has adopted the method, except for cataracts complicated by central corneal opacity, by posterior synechiæ, or by high ocular tension, etc. Dr. Chisolm¹² prefers the combined operation. Drs. Galezowski and Mooren use either, according to the indications, but prefer the simple operation. Noyes¹² operates in selected cases without an iridectomy. Dr. Roosa¹² prefers the simple extraction, likewise Dr. Pomeroy. Dr. Derby adheres to the combined. Taylor has operated on 500 patients by the simple method in three years, and is satisfied with the result. Schweigger's⁴ careful conclusions are not greatly different from those of Knapp, already quoted. He has thoroughly tried both plans,—for example, by operating on the second eye by the simple method to contrast the results with those of the earlier extraction by the combined plan in the other eye. He has in this way been unable to determine if the round pupil gives in reality better vision or not. Every case must be studied separately, and not approached with the plan of operation decided upon in advance. The extraction, according to Notta, advocated by Colombe²³ is effected without iridectomy. Bull² reports 36 cases of simple extraction by Daviel's method, with vision obtained, $\frac{2}{3}0$ to $\frac{2}{10}0$, 33 cases; $\frac{2}{20}0$, 2 cases; perception of light in one. The advantages are, the natural appearance of the iris; central vision is as good, and peripheral vision better; there is less liability of capsular incarceration. But the technique of the operation is more difficult, and it is contra-indicated by a narrow anterior chamber, rigid iris, or fluid vitreous. An iridectomy is necessary if the corneal incision is too short, or the iris is injured by falling before the knife. Panas is a strong advocate of the simple extraction, and

Da Gama,⁶⁶ of Bombay, advocates the method. Powers⁹⁹ prefers the simple extraction when strong contra-indications do not exist. Dehenné⁸³ is enthusiastically in favor of it; Abadie hardly less so.

From the above counting of ballots, in only a partial vote, it will be seen that there is a strong inclination in the profession to forego the iridectomy. The optical and cosmetical reasons against a disfigured iris should certainly not be considered too lightly. The more scientific use of myotics and mydriatics also lessen the dangers and difficulties of the operation, and this is especially true of the anæsthetic cocaine. The proper attitude of mind should be one free from prejudice, and a consideration of each case as a separate study. Sometimes the contra-indications are clear in advance, but they generally arise during the operation. A fluid vitreous or rigid iris cannot generally be foretold. A rigid exclusion of either method as a permanent rule of conduct seems opposed to the best operative principles, a good surgeon being always more or less governed by the exigencies of the moment. There can be no doubt that the ideal operation contemplates a non-mutilated iris.

Another point in the operation of cataract extraction about which there is a great difference of opinion is the old one of *the incision*, and the controversy has nearly become narrowed to the question of a return or not to the Daviel flap. The modification of Graefe has long been the generally accepted and practiced operation of the great majority of the profession, and undoubtedly to-day commands a majority, but by no means the unanimous assent of its members. The reason of this return to the older method is the discovery of the antiseptic treatment of wounds and the security against suppuration that it offers. Before this method came into general use the flap incision brought with it a certain sequence of suppurative results,—the proportion variously estimated from 4 per cent. to 10 per cent. To-day the liability of suppuration is, under Lister's beneficent discovery, reduced almost to zero; and the objection to the flap, so far as this concern obtains, consequently falls flat. It is true, as Schweigger⁸¹ says, that no statistics of sufficient reach and breadth exist at present to compare the two results; but this is no answer to the logical grounds urged by those advocating the change, who might properly answer that there were likewise none when Graefe made his great improvement. Schweigger rightly says that a large deal of the suppuration had nothing

to do with either the form or the position of the incision, which reveals the heart of the new contention, viz., that antiseptics leaves us free to choose form, and site, and extent, as may be dictated by other reasons than the fear of post-operative suppuration. What are some of the reasons for adopting the flap? Undoubtedly the chief is the superior ease, and the freedom from uncertainty and danger in the merely manual part of the procedure. The technique of the Daviel, De Wecker, or Jacobson flap incision is incomparably easier of execution than the modified linear Graefe. The questions of superior or inferior flap may be left out of the count. Schweigger⁴³ traces the steps by which, while adhering to the name linear, ophthalmic surgeons, from Graefe himself to his latest followers, have been by the force of circumstances driven away from a real linear, and in reality practice a modified flap, instead of a modified linear, incision. He points out that in a true linear there is no place for the iris near the lens, and which must therefore be sacrificed; that the lips of the wound, being small, do not unite readily; that there is a tendency of the wound to gap, thus favoring prolapse of the iris, etc. There can also be no question that the danger of the iris falling over the advancing knife, or of the misdirected point itself piercing the iris, is far less than in the Graefe cut, especially since eserine is now used and controls the iris danger entirely. Jacobson⁸¹ and others contend that the danger from operations in the transparent cornea is greater than in the sclerotic; but Graefe thought the exact reverse, and Schweigger believes his own operative results negative the view. The large iridectomy necessary in the Graefe operation to prevent strangulation of the iris at the angles of the wound, and to allow the exit of the lens is now, or may be, avoided. Those valuing the non-mutilated pupil cannot be enthusiastic in favor of the linear incision. There is far less danger of prolapse of the vitreous. The site of the incision in the Graefe puncture and counter-puncture is dangerously near the ciliary body; whence the risk of sympathetic ophthalmia from a slight error that could not happen in the flap incision. These and other minor arguments have been advanced during the year by those favoring the return to the older method. Almost the sole argument advanced for the continued use of the linear incision is a more facile expulsion of the lens and the hoary one of greater liability to suppuration, and—the reverence due to

a great name. Of course, the first are matters of vast importance, and the latter of none at all, though probably the most powerful. Coppez⁷ has operated upon 1059 hard cataracts in the past twelve years, 254 of which were by means of the simple flap operation of De Wecker (a great name, associated with the change), now preferred for most cases. As to secondary cataract, he met with it 120 times out of 962 combined operations, and only ten times out of 254 simple operations,—a striking contrast. Mr. Taylor⁷ has operated on 500 patients in the last three years by the simple method, small corneal flap. Galezowski⁴⁶ has had two failures out of 363 operations by the Daviel method since 1885. C. H. Williams¹⁰⁰ concludes from a limited series of cases, wherein both methods were put upon trial, that his average length of treatment was shortened and the average visual acuity was greater in the Daviel method. Powers,⁹⁹ Da Gama,⁶⁶ Schoeler,⁴ Sattler, Schweigger,⁴ Becker, Panas, Abadie,¹⁶ and many others have adopted some form of the modified Daviel. Indeed, most of the authorities quoted above as favoring the omission of the iridectomy practice the flap extraction. The two naturally go together, and the control of the iris complication by eserine, the freedom from pain and attendant troubles from the use of cocaine, and, lastly, the avoidance of suppuration by antiseptic precautions, all bring into the problem new factors of which neither Daviel nor Von Graefe had any knowledge, and thus make our own duty of independence of authority and habit all the more pronounced. Without prejudice, it may safely be said that the trend of opinion is towards the proof by trial of the flap extraction without iridectomy.

A third procedure connected with cataract extraction that is under discussion is the *extraction of the lens in its capsule*. Burnett²⁵ performed the operation with success in two cases. Pagenstecher⁴ has during the past ten years operated upon seventy-five cases of double cataract, extracting the lens in its capsule upon one eye, and without the capsule in the other eye. Often the visual acuity was greater in those of the first class; but on the whole he could detect no considerable difference in this respect. Particularly adapted to this operation are overripe cataracts, because of the greater resistance of the capsule; Morgagnian cataracts; presentation of fluid vitreous after the incision; those resulting from posterior synechia; luxated cataracts. Augmented tension is a contra-

indication. Samelsohn⁴ adds to these indications, for capsular extraction, a soft and compressible globe. De Wecker⁴⁶ thinks the operation a dangerous one, and only justified in the exceptional cases where there is dissolution of the zonular and anterior detachment of the vitreous from its envelope. There seems to be little tendency to run the numerous hazards of the operation for the comparatively slight advantage of obviating the possible secondary or recurrent capsular cataract.

Extraction of the anterior capsule, or an excised piece of the same, by means of the cystitome or capsular forceps, is an operation practiced by De Wecker, Meyers, and others, and from which it was hoped there would result a lessening of the number of cases of recurrent capsular cataract. The instrument used is one little known in this country, but of frequent use on the continent. It is simply a double cystitome combined with a light forceps: it is entered closed, and when in contact with the capsule is opened at pleasure so that a flap of the capsule is excised, and upon closure and retraction the flap is brought out of the wound. De Wecker,⁴⁶ who uses this method, thinks the operation feasible in 90 per cent. of all cases. Gayet⁴⁶ calls the operation a genuine progress. The study of Silex¹⁹ is the most considerable one yet made upon the subject, and is based upon 122 operations. From the results it strangely appears that the hoped-for avoidance of secondary operations is not realized, as twenty-seven cases required the secondary operation, or 22.2 per cent. of the whole number. The percentage of loss was 4.9. Schweigger¹⁹ also notes the large number of posterior synechie following the use of this method in his practice, a result of the frequent iritis that ensues upon the capsular extraction. In Silex's cases this complication existed in 16.3 per cent. Förster¹⁹ was unable to extract the capsule twelve times out of 100 trials, whilst of the 122 cases reported by Silex there was but a single failure. The reason given for the better result is the improved modification of the teeth of the forceps suggested by Schweigger. There is also a notably high percentage of 16.2 per cent. of prolapse of the vitreous. As to visual acuity, 89.3 per cent. were finally accounted successful. There were six complete failures. In Schweigger's nineteen cases 12.9 per cent. required secondary operation, and there was 9 per cent. of loss. The operation, so far, therefore, does not seem to keep its promise.

41. *Extraction by Injection.*—In 1884 McKeown introduced a method of extraction of soft cataract and cortical remains by the irrigation of the anterior chamber. Up to the present time the number of cases so treated by McKeown⁴¹ is about 100, and the results seem to him highly satisfactory, so much so that he even speaks of operating upon unripe cataracts whilst yet the details of the fundus were visible. Taking the records of four hospitals and nine surgeons, he finds in a total of 533 uncomplicated cataracts that there were only 11 (or 2 per cent.) immature, whilst in his own cases, out of 81 he had 22 (or 27 per cent.) immature, and notwithstanding this his losses were but 5 per cent., as against 8.5 per cent. for ripe cataracts in other hospitals. Lee⁴¹ gives the details of six cases of soft cataract successfully removed in this manner. The method consists in the usual incision and iridectomy (why iridectomy?), when the nozzle is introduced into the anterior chamber and a stream of pure water (or sodium chloride solution), at a temperature of 95°, from a reservoir at a height to give the desired pressure, is allowed to flush the chamber clean of cortical masses, etc., which are thus floated up and out of the chamber. Dr. Wicherkiewicz²⁷ is said to have devised the method independently of McKeown, and has found it of especial value in unripe cataracts instead of artificial maturation. Terson¹⁰¹ notices that the injection of liquids into the anterior chamber was either used or proposed by Saint Yoes in 1722! Grand-Clement³¹ uses a weak solution of biniodide, according to the suggestion of Panas that not only irrigation but antiseptis is also required. But Panas' recommendation of mercurial solutions has generally been abandoned, these having been found irritating to the eyes of rabbits by Bettremieux and Vassaux. Chodin²⁷ uses a 4 per cent. solution of boric acid, and Logetsechnikow²⁷ adds eserine to avoid iritic adhesion. Williams² reports five cases successfully operated upon with sodium chloride solution, and a specially constructed apparatus. Mr. Davidson⁴¹ uses a boric acid solution, and his results are stated as "most satisfactory." Röhmer⁴⁶ thinks that in the extraction of soft cataract, irrigation of the anterior chamber is necessary to prevent plastic iritis and occlusion of the pupil. Vacher²⁷ uses a syphon and a biniodide solution $\frac{1}{12000}$ to $\frac{1}{15000}$. Terson¹⁰¹ describes an instrument and the method of operation practiced by himself. Khodine⁷⁴ has operated by this method in eighty cases

with entire success. Thomson has for years practiced thorough irrigation of the anterior chamber, after cataract operations, with antiseptic solutions.

It seems somewhat strange that this method should have been looked at askance by so many (see, *e. g.*, *Brit. Med. Jour.*, Sept. 20, 1887, and the subsequent issue of Oct. 3). It certainly is not absurdly unreasonable, and offers a means of escape from what in a certain sense is a matter of reproach to the profession. We mean, of course, the acquiescence in the long and exasperating period of maturation of a cataract after vision, for all practical purposes, has been lost. It is a wretched piece of news to tell any one we may not be able to bring vision back to him perhaps for years, that matters will gradually grow worse, etc. But if, besides the patient's own feelings, the support of a family, or other weighty concerns hang upon the fate of the eye in question, the consequences are then so tragic that they should arouse us out of our cool assent to what perhaps is by no means a necessity. We doubt if this period of waiting (in one case we read of twenty-four years!) has its analogue in any other department of surgery. We by no means argue that the waiting may not at last be found a sad necessity; but a zealous desire to test a procedure offering such great relief of suffering would seem to be both a more humane and a more scientific attitude of mind than one of captious and suspicious indifference.

42. *Electric Treatment of Cataract.*—Following up the discussion drawn out by Neftel in his statements as to the effect upon incipient cataract of the galvanic current, Colburn³⁴ has been testing the power of the battery to effect any influence upon peripheral and other forms of cataract not far advanced. There was no improvement in three cases; in six there was permanent improvement, the cases being under observation four to seven years; in three cases there was complete removal of the short lines and nebulae; in two cases there was complete absorption of opacities. "In all cases in which the disease is progressive, as indicated by the fat granules and nebulae, where electricity is well borne, where the choroid and retina are not greatly degenerated, and where there are no complications of cirrhosis of liver or kidneys, diabetes or organic disease of the heart or lungs, improvement may be expected."

43. *Artificial Maturation.*—Schweigger¹⁹ proceeds to the extraction of unripe nuclear cataract without any hesitation as to the

extraction of the whole lens. Cortical remains are not left behind, even when, with mydriasis, the fundus may be clearly seen. Also in posterior cortical cataract there is but little doubt that no cortical masses will be left behind in early operation. In such cases, therefore, there can be no question as to artificial ripening. In other instances, when, from the age of the patient, or from the long unprogressive continuance of the opacity, we judge the lens to be without the desired uniform consistency,—in such cases, artificial hastening of the maturation is justifiable. A prerequisite is therefore a solid nucleus, or an age of at least thirty years in the patient. Schweigger thinks the preliminary iridectomy at least useless, except in case of a luxated lens, a weak zonula, or prolapse of the vitreous. Förster's plan is the one advised. Röhmer⁴⁶ gives three methods of artificial maturation: By discission with the needle; paracentesis of the anterior chamber and evacuation of the aqueous; massage. Bettmann³⁴ prefers to Förster's plan, pressure directly upon the lens capsule with the spatula. Dr. Girardi¹⁶ quotes Critchet, Barde, Mengin, and Bettremieux, in support of what is also his own view, that a preparatory iridectomy aids the progress of maturation. Panas and Landolt⁴⁶ prefer massage to discission. Burnett²⁵ delivered a lens three weeks after corneal massage.

44. *Considerations precedent to the Operation.*—Critchett⁴¹ calls attention to the fact that age is no contra-indication to cataract operations, he having had patients 84 and even 96 years of age, who successfully withstood the operation. Burnett²⁵ alludes to the difficulty of diagnosis of black cataract, advising the employment of the old Sanson or catoptric test. In one of his cases the third or inverted image of the candle reflected from the posterior capsule of the lens was absent, and the location of the lesion of transparency in the lens (a black cataract) was thus easy. In another case, like the first, with complete absence of the fundus reflex, the inverted image was present, and the lesion (choroiditis with serous effusion) was consequently placed in the vitreous. In any case of concurrent lachrymation or dacryocystitis, Dehenné⁸³ precedes the operation by catheterization of the duct and injection of the passages with a boric acid solution. Schweigger¹⁹ is more thoroughgoing still. Girardi¹⁶ urges the advantage generally of a preliminary iridectomy, but this is rarely thought advisable by

most practitioners. Collins²¹ effectually silences the reports of the supposed evil effects of cocaine in operations, by quoting the results of loss in the London Hospital under its use and before its discovery. With cocaine the percentages of loss from suppuration, loss of vitreous and severe iritis, were respectively 1.13, 8.3, and 3.49. Without cocaine the corresponding figures were 6.2, 14.2, and 7.1. The profession is unanimous in the use of cocaine and the antiseptic methods of conducting operations. The thoroughness of Schweigger's precaution may be gathered from his habit of making the patient bend the head down backwards so that the one to five thousand solution of the bichloride shall thoroughly reach the conjunctival sac of the upper lid. Dehenne⁸³ cautions that the cocaine should be a fresh solution. The method of antisepsis varies with different operators; but most use boric acid or bichloride solutions for irrigating the eyes, etc., prior to operation, and other germicides for instruments, hands, etc. Galezowski is opposed to the use of atropine prior to the operation.

45. *Operative Methods.*—Colombe bandages the sound eye while operating. Powers uses a new knife for each operation. Reynolds does not use fixation forceps, but steadies the globe with his fingers. Katzouroff⁷⁴ does not use a blepharostat, but holds the lids open with the left hand. Mooren uses no instruments but a Graefe knife and simple forceps to fix the eyeball. He, Galezowski, and Colombe lacerate the capsule with the knife. Manolescu uses corrosive solution and toothed forceps for removing the anterior capsule. Schweigger in returning to the flap operation laid aside the Graefe knife, and uses the Richter or Beer blade. Gayet¹⁶ believes there is frequent injury of the iris and cornea by the cystotome. Panas, referring to the size of the incision, says it is impossible to say in advance whether the lens is large or small. Schweigger,¹⁹ in his masterly way, has subjected several methods of operation to the rigid test of experience, among them the plan proposed by Adam Schmidt, Rivaud-Landrau, Hasner, and Rheindorf, of *opening the posterior capsule* after extraction of the lens. Twenty-two out of forty cases, or 32.4 per cent., required a secondary operation, with a total loss of 8.8 per cent. The idea of the operation was, of course, to crowd the capsules aside by the advance of the vitreous, and thus avoid recurrent capsular cataract. Schweigger also gives the results of his operations by the two dif-

ferent methods of opening the capsule. Gayet advised the *peripheral rupture*, and Knapp uses it entirely. The procedure is, in a word, as follows: The incision and the iridectomy are done as usual, but the cystotome, instead of making a central opening according to the Graefe method, is carried under the median edge of the coloboma of the iris, and cuts the capsule parallel with the equator up to the temporal border of the coloboma. The statistics of the Graefe capsulotomy show that out of sixty cases there was a percentage of 21.66 requiring secondary operation, and 3.33 of loss. Out of eighty-seven cases of peripheral capsulotomy there were seventeen cases of secondary cataract, or 19.6 per cent. with 1.1 per cent. loss. Though small, the balance is nevertheless in favor of the peripheral rupture. But the most important point of contrast between the two methods consists in the consequent iritis. Schweigger finds in the Graefe method of rupture that iritis, generally slight, follows in 50 per cent. of all cases. In the peripheral rupture it is only highly exceptional, even in secondary cataract. It seems conclusive, therefore, that the loose capsular edges left behind in the Graefe method of operation exercise an irritative influence upon the adjacent iris, which, though not usually great enough to light up severe iritis, may nevertheless be great enough to produce a more decided trouble, with plastic exudation, etc. Panas⁴⁶ adheres to the circular incision of the capsule. Galezowski practices the peripheral. Knapp confesses that the peripheral is followed by a greater number of secondary cataracts, but Schweigger does not think so. Schoeler⁴ looks with disfavor on the operation because he thinks it increases the secondary operations and the chances of infection. Of 200 cases, Knapp had ninety-one dissections follow the peripheral capsulotomy. Schweigger fixes the eyeball by a grasp of the conjunctiva below, and the forceps are then held by an assistant, whilst the operator seizes the conjunctiva with a second forceps in the horizontal meridian. The knife is entered at the margin of the cornea, and exactly in the direction it is to follow throughout the incision. The direction of the point to the centre of the pupil, in order to make larger the inner border of the wound, has no practical value. Landolt emphasizes the value of a *large iridectomy*.

46. *Complications*.—Mules⁴¹ asks, What shall we do if, during corneal section, the iris falls over the knife? In his own case he

neither proceeded with the operation, cutting out the entangled iris, nor did he withdraw the knife and wait to operate later. He withdrew and, despite a shallow chamber and no aqueous, he made a fresh puncture high up, and made an iridectomy preliminary to a later extraction of the lens. Taylor⁴¹ thinks that with a little practice the iridectomy may be made with the knife, as he has been in the habit of doing, and the coloboma be in no way inferior to that secured by any other method. Doyne⁴¹ thinks Mules's expedient a dangerous precedent, and recommends in such an emergency that the eyeball be drawn forward on the flat of the knife, after the counter-puncture has been made, when the iris will roll off the edge of the knife. Bower obviates the trouble by a preliminary iridectomy. In case of calcareous degeneration of the lens preventing capsulotomy, Galezowski⁴⁶ seizes it with the capsule forceps and draws it out of the wound. He has done so eight times out of 307 operations. He avoids *hernia of the iris* by never using atropine prior to the operation, and by making the corneal wound high up—two to two and one-half millimetres from the border. Prolapse of the iris, not only, as Critchett called it, the *bête noire* of the flap incision, but of others as well, is a sorry result that turns up with every operator more or less frequently. Coppez,⁷ Schweigger,¹⁹ Bull, Burnett,²⁵ Panas,⁴⁶ Taylor,⁷ and many others, by the use of eserine, either injected in the anterior chamber or instilled in the sac, lessen the dangers of this complication. Those advocating the flap incision think the dangers of iritic adhesion are thereby greatly lessened. Galezowski⁴⁶ thinks eserine irritating; neither does Powers use it. Dehenne⁸³ employs atropine. Schweigger⁷⁴ does not excise the adhesion for several days. Coppez,⁷ using the flap extraction, has met with this complication twenty times out of 254. He leaves it alone; thinks it gives rise to less trouble than the pinching up of the iris in the angles of the wound in the combined operation. When the adhesions are firm, Abadie,³¹ through a small corneal incision, excises the adherent portion of the iris. If the prolapse be small, the galvano-cautery may be utilized in destroying it. But he advises against haste in doing any reparative operation, and thinks we should temporize so long as there is no pronounced aggravation of symptoms. Often the cure is spontaneous, or no bad result follows. Most authors do not agree with this advice, but consider it best to break up the adhesions before the patient passes

out of sight. This is urged by Suarez de Mendoza.¹⁶ In case the *capsule* becomes *incarcerated* in the wound, the consequences are less dangerous; but the bridge of tissue connecting capsule and wound should be divided, either by a sclerotomy, as Abadie³¹ suggests, or by any incision the circumstances may suggest. Bottard²³ describes a case of *cerebral hemorrhage* causing death, that happened during an operation for cataract. Had the operation been done under chloroform instead of cocaine, the consequence would have been ascribed to the influence of the anæsthetic. Dujardin¹⁰³ adds another instance to the few recorded of *hemorrhagic cataract*—a complication always leading to destruction of the globe. The term used may be criticised as a misnomer, since there is, of course, no hemorrhage of the cataract. It would be more proper to speak of a post-operation hemorrhage. It arises generally from a rupture of some choroidal vessel, and is followed by detachment of the retina, expulsion of the vitreous, etc. De Wecker has had 8 cases in 3000 operations, and Fieuza 2 in 2000. Burnett's patient²⁵ lost an eye by *vomiting*, and another case was complicated by *acute mania*, probably due to atropine. Galezowski⁴⁶ believes that *glaucoma* following cataract is from constitutional predisposition. Schweigger¹⁹ reports a case of this rare complication, and says: "I had not supposed it possible that an eye upon which a broad iridectomy had been done during cataract operation, should within a few months become absolutely blind from acute glaucoma. It contradicts the theory; but the most brutal fact is preferable to the finest theory." Stölting¹⁸ gives the detailed results of the macroscopic and microscopic investigation of his case, and reviews the literature of the reported cases, numbering but five. There was in Stölting's case capsular adhesion in the wound, occlusion of the pupillary area, detachment of the retina, an excessive development of Müller's muscle, pressing on the canal of Schlemm, etc. The conclusion is that the increased tension arose from stasis of the lymph-streams in the perichoroidal spaces. In Schweigger's¹⁹ report most of the losses arose from *irido-choroiditis*; there is one case of unexplained *prolapse of the vitreous* after the operation was safely over; a curious case of *sympathetic iritis* with the inciting (operated) eye preserved; several cases of *retinal detachment*, associated with myopia, one of which took place three and one-half years after the operation. Davidson's⁴¹ case of *astigmatism* after traumatic cataract is

so extreme that it deserves mention. With a cylinder of 13 D., axis vertical (combined with a plus spherical lens of 4.5 D.), the patient was enabled to read Jaeger I. Galezowski¹⁶ accounts for much of the post-operative astigmatism as arising from the absence of the lens which, prior to its removal, neutralized the corneal asymmetry.

47. *After-Treatment.*—The somewhat unseemly discussion concerning reintroduction of a less complicated system of after-treatment of cataract patients is to be regretted. Rediscoveries and independent discoveries are not such uncommon occurrences. The points claimed as progressive steps relate to the banishment of dark rooms and cumbrous bandages, the substitution of light dressings or even semi-transparent plasters, and the greater freedom generally allowed the patient in the days following the operation. Since its opening, in 1877, Thomson has not used thick compresses or dark rooms at the Jefferson College Hospital. The operation is preceded and conducted under strict antiseptic precautions. The patients are placed in the open, well-lighted wards of the general hospital. The dressing is simply a single black woolen or silk bandage, and a bit of absorbent cotton to fill the orbital cavity. Next the eye is placed a small oval of patent lint, moistened with vaseline. In the last 100 cases there is but one case of panophthalmitis recorded as strictly due to the cataract operation itself. Severe traumatism following the operation caused suppuration in a second case. Michell⁴³ has practiced this method for twenty-five years. He restricts movements, but allows the patient to attend to the "calls of nature;" he does not allow the eye entire freedom for ten days. Chisolm²⁴ has followed similar methods in 167 cases, likewise with the greatest satisfaction. Isinglass plasters are used as dressings; the free use of the non-operated eye is allowed from the start; the patient is not confined to the bed, but walks about the ward, talks, etc. The light is only partially excluded by blue curtains. Murrell³⁴ is pleased with the results of this treatment in five cases. Levis²⁵ long ago discarded bandages and dark rooms, substituting therefor adhesive plasters. Agnew learned the method thirty years ago of Wilde, of Dublin, of closing the eye with two narrow strips of isinglass plaster, and used it many years, returning to the bandage under Graefe's influence. Burnett²⁵ long ago abolished the "relics of barbarism." He thinks the

adhesive plaster too stiff and uncomfortable, and no protection,—*e. g.*, from the hands during sleep, etc. He uses elastic flannel two and a half by six and a half inches, with tapes, placing first a thin layer of cotton cloth, antisepticated, over the closed lid, with absorbent cotton to fill the orbital cavity. He inspects the lids in twenty-four hours, and if there is no swelling, he does not inspect the corneal wound till the end of the third day. Snell⁷ says experience has taught him the value of plaster instead of the bandage. He uses salicylated isinglass plasters, and he has thus treated fifty-three cases in all, thirty-two of cataract extractions and the balance iridectomies. Dehenné uses boricated vaseline on cloth next to the lid, a little cotton and three turns of a bandage. Pagenstecher,³⁶ of Wiesbaden, is said to have discarded all dressings whatsoever. Montgomery³⁴ finds the isinglass plaster will not do in summer, and is also uncomfortable. While believing in the modified after-treatment, he uses therefor a gauze-roller bandage with cotton to fill the cavity. He has had twenty cases; he bandages but the one eye. Ayres¹² also practices the modified treatment. Reynolds' dressing is a minute film of absorbent cotton held in position by strips of adhesive plaster, one by one and a half inches from lid to brow, renewed daily. Mooren¹² uses a light compress, retained by strips of adhesive plaster from temple to temple. He allows them to remain not longer than four days. To prevent suppuration Galezowski¹⁶ uses disks of antiseptic gelatine, medicated with sublimate and cocaine, slipped under the lids and left. He has had 2 cases of suppuration in 300 extractions. To prevent the iris being pressed forward by ocular movement, he does not open the eye for five to six days. Panas thinks three days long enough. Schweigger⁷⁴ waits for several days. Keyser never operates without examination of the urine for albumen. Lyder Borthen,¹⁰⁴ as reported by Dr. Ecklund, closes one eye only after an iridectomy with a bandage, both eyes after a cataract operation. Unless the distance is very great, he allows the patient, after operation, to return home. He uses no darkened rooms, and in two days allows the patient to receive friends, etc. The bandages are removed in three to four days.

48. *Visual Results.*—Mules⁷ describes a case of *double auto-extraction*, the result of accident, in a man of 67, with useful vision in both eyes. Nature sometimes surpasses art! Burnett²⁵ explains

the frequent phenomenon, the noticeable *blueness of objects* spoken of by patients after cataract extraction. A spectroscopic examination of a specimen of black cataract extracted by himself showed a complete absorption of the blue end of the spectrum. The percipient elements of the retina or brain being thus deprived for years of this stimulus, respond so powerfully to it after the removal of the lens that the impression overbalances the others for a time. Graefe was accustomed to regard a visual acuity of one-tenth as a *successful result*; but as this is insufficient for reading and writing, Schweigger places it at one-sixth. This seems a reasonable view. On page 68 are shown some of the results, both as to vision and to total losses, reported by a few of the operators. The figures are given as reported, and sometimes include the gains by secondary operations. The list is manifestly incomplete, and, owing to the different opinions as to what constitutes success, there are but few comparisons that may be legitimately made. Noyes' case of death after cataract extraction (1886) has not been followed by any such result this year. The case reported by Zehender⁶⁸ was a death (after real recovery from the operation) from *echinococcus* of the spleen.

49. *Secondary Cataract*.—The term, as Schweigger¹⁹ says, covers several different conditions. The first class may be considered as comprising those opacities in the pupillary area caused by a thin film between the leaflets of the capsules, or in front of the posterior capsule, when the anterior has been removed. The method of removal is by two discission needles or by the forceps. The second class consists of those caused by opaque lens-substance remaining after traumatic cataract or imperfect extraction. One should be in no haste to perform secondary operations upon these, since they frequently improve in time. A simple needle operation is usually all that is needed to spring an opening in the curtain. For the third class, the firmer relics of the cataract, slightly, or not at all, united to the iris, extraction is the best method; and for this purpose, the cystitome forceps are best adapted, as the membrane is apt to slip away from non-toothed forceps. Schweigger fears no bad results from this method of extraction, since, he says, the piece grasped by the forceps generally breaks off and does not tear away from the zonula. When there is extensive union of the membrane with the iris, the iris must be operated upon, and one has to choose between iridectomy and iridotomy. The worst form of secondary

cataract is that in which the membrane filling the pupillary space is composed of inflammatory new-formed product. When the posterior surface of the iris is covered with the exudate, iridectomy and iridotomy are both alike apt to fail. This condition of affairs is diagnosticated by the fact of an iritis having closed the pupillary area and the iris being pushed and belled forwards. If the iris lies flat and the anterior chamber preserves its normal depth, the absence of a retro-iritic exudate is not thereby rendered certain, but there is in such cases better promise of success with an iridectomy or iridotomy. The less the pupillary area is narrowed and displaced upwards by a clear-colored membrane, the more favorable are the conditions for a successful operation. Coppez⁷ met with secondary cataract 120 times in the 692 combined operations, and only 10 times out of the 254 simple operations,—figures which speak for themselves.

DISEASES OF THE VITREOUS.

50. *Posterior Hyphema* is the name given by De Wecker to blood in the vitreous visible by the naked eye. Dujardin¹⁰³ describes such a case, recurring consecutively in both eyes. Vision was not permanently destroyed. The literature of the subject is reviewed. The real causes of idiopathic cases are unknown. The case of Deleus⁷⁴ was caused by injury; a posterior sclerotomy gave exit to a large quantity of blood, and recovery followed. The case of Rolland⁶³ was almost identical. Dr. Theobald's² case of recurrent retinal hemorrhage was followed by the development of blood-vessels in the vitreous, and a similar case is reported by Carmalt.² Hansell's²⁵ report of two cases of *newly-formed blood-vessels* in the vitreous is accompanied by a scholarly review of the sparse literature of hyaline disease. *Bony formations* are reported by Burnett³⁴ and Lamb.³⁴ Cases of *cysticerci* in the vitreous are reported by Bassières⁶³ and Van der Laan.⁷ The impossibility of diagnosis in the latter case led to long courses of treatment, local and constitutional, for the inflamed and glaucomatous condition. Paracentesis was performed several times. Finally an ophthalmoscopic examination was possible, and the parasite detected.

DISEASES OF THE RETINA.

51. The *obscure type of retinal inflammation* described by Goldzieher⁹⁵ is analogous to that of Hutchinson. The fovea,

papilla, periphery, and the vessels are apparently not affected, only the perimacular region; here are found bright, yellowish spots, of irregular shape and size, grouped for the most part about the macula, but not invading it. There were no affections of a constitutional nature present. There was some sclerosis of the arteries in one case. Sometimes retinal hemorrhages coexisted, and there was always a central scotoma corresponding to the retinal lesion, but no pigmentation. It may be in one or both eyes. The affection seems therefore to result from some changes in the arterioles or blood-supply of the parts in question. The conclusions of Ostwalt,³⁸ from a study of five cases of *commotio retinæ*, are in some respects opposed to those of Berlin. The peculiar grayish appearance and œdema of some parts of the retina following contusions of the globe, are found to correspond to the defects of the visual field. Berlin's conclusions were that the impairment of vision did not depend on the retinal changes, but was central. The temporary total blindness following a blow is explained as due to the anæmia caused by reflex contraction of the vessels. Dr. de Schweinitz describes four cases of *retinal hyperæsthesia*—pain in the eyes, frontal headache, photophobia—coexisting with *oxaluria*. A casual relation between the two facts is not regarded as established, and in three of the cases there was insufficiency of the interni. The author says the ocular symptoms persisted under a mydriatic, the use of correcting glasses, and even abstinence from eye-work, until the oxaluria was banished; but he nevertheless believes the ocular symptoms, without correction of the ametropia, etc., would not have disappeared with the oxaluria. Darrier's cases⁸⁵ of *retinitis pigmentosa* present some interesting anomalies. One patient, though night-blind from childhood, had been able to work at his trade, blacksmithing, till his 67th year, when cataract appeared. There was a similar history of the brothers. There were two cases of the otherwise typical disease without the characteristic pigmentation. There was a dark gray discoloration of the retina, narrow vessels, and a pale papilla. Standish² treated a case of *retinitis pigmentosa* with the constant current, once in five days for fifteen months, with marked improvement. Derby's cases¹¹² showed increase of the field under the electric treatment, but no better acuity. Seigheim's study¹¹³ of 73 cases results in a conviction that the hereditary element is the chief etiological factor. In view

of the number of cases in which no such element can be found at all, the reviewers cannot help remarking how unsatisfactory the old explanation seems. Dujardin¹⁰³ reports a case of monocular *glioma* recurring after enucleation, but with this noteworthy complication: Four weeks after the enucleation it was found that the child had become wholly blind in the apparently normal remaining eye. There was not a single ophthalmoscopic sign to show cause of the blindness, least of all any of a secondary glioma. The conclusion was therefore that the malignant growth had followed up the optic nerve, and, reaching the chiasm, had invaded the structures leading to the sound eye. The results of the anatomical study and literary review of Grolman's paper¹⁸ are summed up in the following: Vision may continue for a considerable time after the appearance of glioma endophytum, and depends to some extent on the position of the tumor. Glioma endophytum, the reverse of glioma exophytum, leads comparatively frequently to metastases in the vitreous. Not only after inflammation and perforation, but even in the earliest stages of the disease, with preserved vision, the growth may undergo temporary retrogressive metamorphosis, mercury apparently aiding in this, though it is incapable of curing the disease altogether. Appearance of glioma in the second eye may be feared even without its recurrence in the orbit of the enucleated eye, and even as late as four years afterwards; in such cases the prognosis depends largely upon the age of the patient. Gliomæ arise many times in several retinal layers: even the external granular layer may participate. Sinclair's case² was remarkable for the length of time (six years) the patient was under observation after the double enucleation. As to *Detachment of the Retina*, Galezowski¹² has observed it 789 times in 152,000 patients; 87 cases were binocular, 63 in emmetropic and hyperopic eyes; 194 were of traumatic origin, 13 after cataract extraction; 18 were in syphilitic, 4 in sympathetic affections. Tumor was found in ten cases; cataract is frequent. Rupture of the retina he thinks a consequence, not a cause. The treatment consists in antiphlogistics (leeches, etc.), atropine and rest. He has had complete cure in seven cases. He has ceased advising iridectomy, and now aspirates the fluid through a scleral opening. Two out of seventeen cases were thus cured. De Wecker (Traité) treats his cases with prolonged rest on the back, compression bandages, injections

of pilocarpine and mercurial preparations. Guaita³¹ has used eserine five times in detachment, four of the cases being acute and one chronic. He reports an amelioration rapid, progressive, and marked in all the cases. Upon suspension of the treatment there was either a cessation of improvement or a relapse. He applied the solution four times a day. Coppez¹⁶ concludes that iridectomy rarely does any good, and more frequently does harm, and that Wolfe's operation, whilst yielding few cures, almost always makes some improvement. It is less painful, less serious, and more reliable than iridectomy. Knies⁶⁸ reports a case that he diagnosticated as detachment, but which he came to believe was only a severe retinal edema. Berger⁴³ had a case of prolapse of the retina in the anterior chamber. Harlan¹¹² had a case of what he diagnosticates as thrombosis and perivasculitis of the retinal vessels suddenly occurring in a woman, with no explanation so far as concerned the condition of the uterus, kidneys or heart. The retinal vessels were bloodless, and there was total blindness in one eye; the other was somewhat similarly affected. Nettleship²¹ gives the details of cases of thrombosis, embolism, and one of retinal hemorrhage from retching. Nordenson's capital study¹⁹² of the pathogenesis of retinal detachment is the most important work of the year upon the subject. We have, first, the pathological anatomy of four cases of spontaneous detachment, in all of which there was shrinking of the vitreous and partial detachment of the same, retinal detachment and rupture, with chronic inflammation of the choroid. This last is held to be the primary lesion, leading to disturbed nutrition of the vitreous. According to the exudation theory, the floating or waving motion of the detached portion, as also the decreased tension, cannot be explained; but upon the explanation of a shrinking vitreous these are understood. A clinical study is also entered upon, based upon 126 cases of spontaneous detachment in 117 patients. The predisposition increases up to 60 years of age, then decreases. Tension was normal in 62 cases, subnormal in 58, above in 6. In 97 cases changes in the vitreous were noticed. Of 97 eyes, 58 were myopic, 26 emmetropic, 13 hyperopic. Of 119 eyes, rupture was found in 46 (=38 per cent.), and most frequently in the upper outer quadrant. It was generally well toward the periphery, the margins of the tear being never rolled outwards.

DISEASES OF THE OPTIC NERVE.

52. The most important contribution of the year on the diseases of the optic nerve is undoubtedly that of Deutschmann¹¹⁴ on *optic neuritis*. His paper contains an exposition and critique of the theories that have been put forth concerning the affection. The results of his researches upset the theory that the "choked disc" depends upon compression of the nerve as it enters the globe. It may be regarded as established that, pathologically, "choked disc" in no way differs from any papillitis. The compression is rather the result of papillitis. The method pursued was the injection of aseptic agar-agar solutions into the optic nerves of rabbits. The result, if the injection was forcible, was arrested retinal circulation and papillitis; if less forcible, there was only temporarily diminished circulation, but no choking of the disc. Since, now, in the choked disc of man there is no interruption of the circulation, it follows that choked disc does not come from compression. Similar experiments made in the cranial cavity proved that choked disc is not produced by intracranial pressure and distended nerve-sheaths. But injection of fluids containing staphylococci, or tubercular pus, developed the typical papillitis. Not pressure, therefore, but an irritating fluid, passing along the spaces of the nerve-sheaths and stopped at the entrance of the nerve into the eye, is what sets up the inflammation. In tumor, abscess, or other gross lesion of the brain, which are the commonest causes of papillitis, there is indeed usually greater pressure; but there is certainly also some abnormal or irritating ingredients, as microorganisms, syphilitic virus, entozoa, etc., which are the real sources of the trouble. As to meningitis, which may produce neuritis, Deutschmann thinks the neuritis an infectious process, but an ascending one, the bulbar end being infected earlier than the nerve itself. Optic neuritis consequent to other affections, as hydrocephalus, malformations of the cranial bones, cerebral hemorrhage, traumatism, etc., is variously explained without abandoning the essential position the experiments are held to prove. Whatever the ultimate cause, choked disk is an inflammation, a true neuroretinitis, set up, not by compression, but by the presence at the bulbar end of the nerve of some irritating substance. Edmunds and Lawford² hold that Deutschmann's experiments are not wholly

conclusive, stating that examination of the nerves shows that they are always affected in their whole length, and that therefore the inflammation is a descending one; and that to prove his point Deutschmann would have to show that in animals killed shortly after inoculation there was no optic neuritis. They incidentally state that out of ninety-six cases of fatal cerebral tumor, optic neuritis was present in 86 per cent. of those cases in which the growth was in the basal ganglia or cerebellum; whereas in only 46 per cent. of those cases where the tumor was at the convexity of the brain was there any papillitis. In 30 per cent. of cerebral tumors therefore there will be no neuritis, and when it does occur the chances are that the growth is not in the cortex. Hirschberg²⁷ cites several cases of idiopathic neuritis that recovered under iodide of potassium. He calls attention to the fact that this kind of trouble occurs so often in women, although no explanation of the fact has been found. Friedenwald's case³² is similar to Hirschberg's. Gutmann's case⁵⁷ proves Deutschmann's observation of animal experiments to be true in man, viz., that typical optic neuritis may follow infectious injury of the front part of the eyeball. In a patient suffering from severe monocular neuritis, with blindness of the temporal side, and unrelieved by specific treatment, Carter¹⁶⁴ rotated the globe inwards after division of the external rectus muscle, and exposing the optic nerve, incised its sheath, giving exit to the contained fluid. Headache was at once relieved, and a recovery of sight and health soon took place. He advises the operation in cases of swollen optic disk accompanied by visual impairment. The case of Pooley,³² of double optic neuritis in connection with Menière's disease, but without brain lesion, is of interest. In Smith's case¹¹⁷ there was recovery under specific treatment. Brailey's case¹¹⁵ of hydatid cyst in the orbit caused unilateral optic neuritis.

Abadie³⁷ is inclined to think the cases of *pseudo-atrophy of the papilla* (advanced by Trousseau as showing all the clinical signs of optic atrophy followed by complete restoration) were in reality cases of toxic amblyopia. There would seem to be little doubt of the fact. To Leber's fifty-four cases of *hereditary optic atrophy* Habershon² adds seventy-five others, making a total of 129 cases recorded. The majority of cases occurred either at or about puberty or (a minority) about the age of sexual decline. The conclusion reached is that a neurotic diathesis preëxists, and that the

disease is called forth by exciting causes liable to affect the nervous system and optic nerve. The clinical picture of the disease drawn by Leber is as follows: The disease is almost exclusively confined to the male members of a family, and consists of a central amblyopia coming on usually with suddenness, and simultaneously, or nearly so, in the two eyes. The failure of sight progressed up to a certain point a few months after the attack commenced, and then remained stationary, without improvement and without manifest deterioration. The fields of vision were never contracted at the periphery, but presented in most cases a central scotoma, more or less absolute. Color sense was abolished or much diminished. There were no symptoms of any importance. Headache frequently accompanied the attack, but was never severe. Occasional functional disorders of the nervous system were present, and subjective light and color phenomena were seen. Sight was never completely lost, and was very rarely improved by treatment. The ophthalmoscope revealed the appearances at an early period of a partial papillitis, while in those cases which were observed later there was pallor with incomplete atrophy of the disc.

Jacobson²⁷ reports two cases of congenital optic atrophy in two children of healthy parents, and for which no assignable cause could be given. The children were otherwise healthy so far as any ocular relations were concerned. The conclusion is reached that some pathological process, whose cause or nature is unknown, must have produced the atrophy of the nerve in intrauterine life, after the structure was formed. *Metallotherapy* bobs up again in Despagne's recommendation¹⁶ that the metals be applied by hypodermatic injection instead of on the skin in cases of atrophy of the nerve. Frothingham³⁴ gives an excellent report of two cases of *tumor of the optic nerve*, of which forty-three cases are on record. Others are reported by Tillaux¹⁶ and Guillet.⁷⁷ Serebrennikova²⁸ *stretched the optic nerve* (De Wecker's method) for idiopathic atrophy. Great improvement is said to have followed the operation. Post¹² details a case of *rupture of the optic nerve at the chiasm*, the result of a blow on the eye. We remember no parallel instance. The lids and muscles were injured considerably, and in attempting to enucleate the globe it was easily pulled from the cavity with the optic nerve broken at the chiasm. In Berger's case⁵⁸ there was blindness from a bullet passing through the chiasm,

SECTION III. GENERAL DISEASES.

GLAUCOMA.

53. Brugsch²⁷ calls attention to a racial predisposition to glaucoma, and states that, while other races show 1 per cent. affected, the Semitic show 4 per cent. He has not been able to determine if the eyeball of the Egyptian is smaller than that of other peoples, but is certain that the cornea is so. Schoen's theory¹⁸ concerning the part played by accommodation strain in the production of glaucoma commands a respectful hearing. Its rôle in the production of equatorial cataract can hardly be questioned; and since the appearance of glaucoma also arises at an age when the tissues of the eye are less capable than in youth of adapting themselves to new conditions of change; and since, moreover, this period coincides with the appearance of presbyopia to complicate and increase preëxisting strain, it would not seem unnatural that some causal nexus bound the two sets of phenomena together. Schoen holds that the constant endeavor of the ciliary muscle to bring the uncorrected presbyope's near point sufficiently near for purposes of satisfactory vision, coupled with its inability to do so, creates irritation, thickening and crumpling of the zonula and the capsular leaflet; and finally the meridional and ring fibres of the ciliary muscle are unable to withhold the *vis à tergo* upon the lens-system, it is pushed forward, the excretory outlets are blocked, and we have acute glaucoma. Iridectomy acts by making an opening through to the closed outlets. Rheindorf's theory⁶⁸ of the pathogenesis of glaucoma is that primary glaucoma is due to a thickened zonula, which obstructs the outflow of the vitreous fluids into the anterior chamber; the secondary variety is due to increased secretion of fluids by the ciliary body and processes, resulting from local irritation. The advance of the lens therefore constitutes the direct cause of increased tension; and if there were no damming up of the fluids in the posterior chamber of the globe, no amount of increased tension would cause a pushing forward of the lens. The tension would be equal in both portions, and the lens would rest in *statu quo*. Hence there must be an imperfect passage of the fluids from the vitreous chamber. As to the cause of the thickening of the

zonula-diaphragm, or of the hypersecretion, no explanation is given, and the reader will see that there is no conflict between the theory of Schoen and that of Rheindorf, though the latter thinks the traction upon the ciliary processes caused by the advance of the lens sets up the irritative inflammation that thus becomes a secondary process. From a minute and careful study of a glaucomatous eye, Stölting concludes that strain upon the ciliary body leads to inflammatory processes in the choroid and blocking of the lymph-streams about the *venæ vorticosæ*, lymph stasis in the supra-choroidal spaces, and thus to narrowed circumlental space. The result was, of course, that the lens was pushed forward, and the adhesion of iris and cornea at the angle was a consequence, not a cause, of the glaucoma. Stilling¹⁹ holds that the optic nerve serves as the route of egress of the vitreous secretion, and that from youth on there is a lessening of excretory filtration, that in glaucoma reaches a point where the physiological secretion is in excess of the capacity of the outlets. The part of Stilling's theory that regards the intersheath spaces of the optic nerve as the excretory channels of fluid-excess is hardly in accord with the results of the latest investigations. The drainage current is undoubtedly from the vitreous to the aqueous chamber. From an anatomical study of seven glaucomatous eyes, Birnbacher and Czermak¹⁸ found evidences of extensive inflammation of the uveal tract, and about some of the vortex veins narrowing of the lumen of the vessels, etc. The obstruction of the angle of the anterior chamber is not only the result of a pressing forward of the iris, but is also due to adhesions and inflammatory exudate. The result is that there is a decreased outflow of the intra-ocular fluids, arising both from restricted venous drainage and from the obstructions of Schlemm's canal. Priestly Smith adds to his theory of the continuous enlargement of the lens and the consequent blocking of the circumlental space, whereby the escape of the fluids from the posterior part of the eye are impeded, the further statement that the advance of the lens, which is the direct cause of an attack of glaucoma, is the consequence of an increase of the amount of blood in the interior of the eye. Conditions tending to overfill the cerebral vein are the common precursors of glaucomatous attacks. The theory is to be more fully developed in the future.

Schnabel⁴³ preaches a crusade against the whole pressure-

theory, and in doing so contradicts so much that has been deemed settled that it is hard to restate his theory seriously. He contends that all our knowledge is but ignorance, and that confusion reigns everywhere because of the "vaunted pressure theory, that forms an arena for a doubtful hypothesis, and of auxiliary hypotheses, themselves sorely in need of assistance." He thinks no causal relation exists between the obliteration of the angle of the anterior chamber and glaucoma; that the advantage of iridectomy is not through its forming an outlet for the posterior fluids; that the rise of tension is not caused by a disturbance of relation between secretion and excretion; that increased tension is not caused by any inflammatory process; that pressure would cause an immobile, but not a dilated, pupil; that the disc-cup is not due to increased tension, nor the ring about the disc either; that the contraction of the field is concentric and not chiefly on the inner side, etc., etc. This is refreshing! One other item of his belief should also be stated: "In no part of ophthalmology are slight knowledge and great positiveness so closely allied as in the teachings concerning glaucoma." According to the author, glaucoma is an affection of the ocular blood-vessels, consisting in spasms of the arteries and degeneration of their walls. The hereditary factor has a remarkable illustration in the cases cited by Howe.⁴³ In three generations eight individuals were more or less affected. Lange gives the particulars of two cases of glaucoma occurring in young people.¹⁸ In one case, a young man of twenty, the increase of tension existed only in the morning, passing off during the afternoon. For a time eserine controlled the symptoms; but at last a sclerotomy had to be performed, resulting in relief for some years. Recurrence of the attacks finally led to an iridectomy with relief to the present time. In the other case the outbreak was connected with a long-standing amenorrhœa. Sclerotomy brought relief. The author speaks also of a clarinet player who was habitually seized with an attack after playing upon his instrument. Eserine would abort the attacks. Lange thinks circulatory disturbances lie at the bottom of glaucoma. He found in 69 cases of simple glaucoma that 43.3 per cent. were myopic, whilst in 94 cases of *glaucoma cum injectione* only 10.6 per cent. were myopic. Randolph⁴³ reports a case of glaucoma in both eyes in a child of 11 years. Vision was very much impaired, one eye of a stony hardness. There were cupped papillæ and

venous pulsation. No operation was allowed. Following the observations of Bunge and Pflueger concerning the scotomata accompanying glaucoma, Sach²⁷ has found five cases out of twenty-seven examined possessing such defects of the visual field. He discusses the possible explanations of the phenomenon. Cases of the dislocation of the lens in glaucoma are reported by Lawford.²⁷ Berger¹²⁵ gives a detailed description of the anatomical changes in the optic nerve excavation of the glaucomatous eye. Armaignac¹²⁶ reduced the tension permanently to the normal in an attack of acute glaucoma by the use of cocaine and eserine in alternate instillations. In a case of acute glaucoma (one eye blind, the other with but a quantitative perception) Simi⁴⁵ reduced the tension to normal and the vision to finger counting $1\frac{1}{2}$ —3 M., by repeated punctures of the sclerotic. An iridectomy completed the cure. Vacher⁴⁶ has had six cases of progressive glaucoma that were not affected by the usual remedies,—eserine, iridectomy, etc.,—and upon whom he performed a posterior sclerotomy, a large incision between the superior and external rectus, allowing the free escape of vitreous. In five cases, he says, there was permanent diminution of tension and of pain, and increase of vision. In the sixth case, one of retinal detachment, no good followed the operation. Motais,⁴⁶ *en dernier ressort*, when all other measures have failed, has been able to avoid enucleation in thirteen cases by the creation of a sub-conjunctival fistula in the posterior division of the eye. In two cases the scleral wound united and the result was not permanent; but in the remaining thirteen cases the fistula was permanent and the tension remained normal. The oldest case was three years, the latest three months. Cases of cure by nerve-stretching are reported by Gilmore⁵¹ and Minor.¹²³

SYMPATHETIC OPHTHALMIA.

54. The vivisection experiments of Gifford⁴³ show the route taken by micrococci in passing from one eye to another is not, as Deutschmann had stated, via the sheaths of both optic nerves, but that in leaving the injected eye they pass out of the globe around the central vessels to the apex of the orbit, and thence to the cranium, where they were found in the pia mater of the chiasm, and thence down the spaces of both nerves, finally involving the supra-choroidal space. Gunn's fine report²¹ of forty-seven cases of

sympathetic inflammation is the most important contribution of the year upon the subject. From the general summary it is evident that the common belief that the young are especially liable to sympathetic disease from injury is not true. The tables show a remarkable uniformity in the number of cases occurring in different ages. As regards the affection of the exciting eye there were six cases with perforated cornea and implicated iris; six cases of wounded ciliary region; three of ruptured ciliary region by a blunt instrument; in eleven cases the anterior part of the eye was penetrated, but exactly what part is not known. In six cases, cataract extraction (Graefe original or modified linear) was the cause; in two, needling operations, and in all these there was iritis or adherent iris. Four other kinds of operations set up the inflammation, and in four cases old corneal ulceration existed in the exciter. The shortest interval was fourteen days; the greatest liability as shown by the intervals is from two to four months after the primary affection of the exciting eye. The two longest intervals, twenty-three and thirty-nine years, were cases with keratitis punctata, and little or no pain in the sympathizer; in two other cases the interval was thirty and twenty years respectively. In reference to the character of the sympathetic inflammation, it was mild in five cases; in more than one-half it was of moderate intensity (keratitis punctata being almost always present), and with loss of the eye in one-half the cases; in fourteen cases the inflammation was acute and very severe, with great pain and loss of sight. The final condition of the sympathizing eye was good in the five mild cases, moderate in twelve cases, bad in twenty-five to twenty-six (nine blind, and in six of these excision of globe). The tendency to a severe type of inflammation and an unfavorable result appears to be greater at the extremes of life. The inflammation was relatively severe after operations. In seven out of eight operations the result was bad. Mere position of the injury did not seem to influence the character of the inflammation or the result.

Wounds of the ciliary region had as low a percentage of severity as those confined to the cornea with implicated iris. The interval appears to have little or no relation with the severity of the disease. In thirty-four cases the exciter was lost, and in thirty of these it was excised either on account of pain in itself or sym-

pathetic affection in its fellow. Where the exciter, although lost, was quiet, and the other eye not in a position to be benefited by the operation, it was not excised. In three cases, the exciter, although not really lost, was excised; in two of these its fellow was already inflamed before the excision, yet ultimately recovered excellent vision. In six cases the exciting eye retained useful vision, although the sympathizer was lost in five and damaged in the sixth. The treatment was atropine in the acute stage, dark silk bandage, leeching or morphia for pain; mercury, in several cases, pushed to mild salivation, "seemed to be of some service;" in eleven cases iridectomy was performed on the sympathizer, generally with doubtful or negative results. Mercury during acute stage; palliative, non-operative treatment during the severe type of inflammation; and non-intervention in the cases of moderate severity except, possibly, an iridectomy,—are the recommendations offered. There was occurrence of sympathetic ophthalmitis after excision in four cases. From an anatomical study of sixteen eyes, Berger¹²⁷ in fourteen out of the sixteen found inflammatory changes of the optic nerve, and thinks, from the presence of cocci in the intervaginal space, that the route of the coccus is along the nerve. Gallenga's success⁶⁹ with instillations of sublimate solution in sympathizing eyes, tends to confirm the migration theory of the cocci. Verdesè⁶⁹ cured a patient by cutting the ciliary nerves. There was no return of sensitiveness of the cornea. In Minor's case the sympathizer became inflamed (cyclitis) after enucleation of the exciter, which last was a case of panophthalmitis. Coleman's³⁴ report of twenty-eight cases of sympathetic trouble in his practice is of value. In the exciter there was cyclitis in eight cases, sclero-corneal wound in five, shrunken globe in eight. The interval was one to seventeen weeks in four cases, four to nineteen years in thirteen, twenty-five to thirty-five years in three. The condition of the second eye was normal in four cases, irritated in fifteen, had iritis with complications in six. Preventive enucleation or evisceration of the exciter was successful in all (eight) cases. Choroidal deposits of bone were found in five enucleations. The recommendations as to treatment are summed up as shown in table on the following page.

Hotz³⁴ reports three cases of sympathetic inflammation arrested by enucleation of the injured eye. Hobby's report¹²⁸ covers a large clinical material, three hundred cases of severe injury, of

which there were thirty-five losses of the sympathizer, thirty-six enucleations during sympathetic trouble, and sixty-seven preventive enucleations,—among these last five cases of subsequent sympathy. Included in the sixty-seven were twelve enucleations made during panophthalmitis. The interval was less than a month in twenty-two cases, one to three months in seven, three to twelve months in three, more than a year thirty-three. The shortest time was two weeks, the longest forty years. Of the thirty-five losses of the sympathizer there were twenty cases of posterior synechiæ. There were two cases of death following enucleation during panophthalmitis. Hobby concludes that enucleation should be advised in case of the retention of an inaccessible foreign body, even though a considerable amount of vision exist. Panophthalmitis is a strong contra-indication. The difficulty of a differential diagnosis be-

CONDITION DIS- EASED EYE.	CONDITION SYMPATHETIC EYE.	TREATMENT.
Blindness.	Normal.	Enucleation in unintelligent and children.
Blindness.	Sympathetic irritation.	Enucleate.
Blindness.	Sympathetic inflammation.	Enucleation not often advisable.
More or less vision.	Normal.	Do not enucleate generally.
More or less vision.	Sympathetic irritation.	Better enucleate.
More or less vision.	Sympathetic inflammation.	Do not enucleate.
Acute ophthalmitis.	Normal.	Never enucleate.
Acute ophthalmitis.	Sympathetic irritation.	Puncture and foment diseased eye, then enucleate.
Acute ophthalmitis.	Sympathetic ophthalmitis.	Treat ophthalmitis, and then enucleate.

tween sympathetic irritation of a foreboding character and that of a perfectly innocent nature is noticed. He has had no experience with cutting either the ciliary or optic nerves, or with evisceration. Cornwall¹² presents a case of sympathy, thirty-five years after the injury, stopped by enucleation. An anatomical examination of Ayre's case,¹² Alt thinks, shows confirmation of Knies' theory of the pia mater sheath as the route of the *materia peccans*. Cases of sympathetic inflammation following evisceration are reported by Cross.⁴¹ Dibble had a case of sympathetic iritis due to an artificial eye. (Enucleation of the exciter was, we suppose, curative!)

DISEASES OF THE GLOBE.

55. *Panophthalmitis*.—Gayet⁸⁵ reports the case of a patient whose illness was supposed to be typhoid, but all of whose symp-

toms proved to be due to panophthalmitis. The inflammation originally started from an alveolar abscess following the loss of a tooth, but the most severe attack was brought about by a suppression of menstruation. The enucleated eye contained cocci, that inoculated in a rabbit's eye produced panophthalmitis and death in twelve hours. Briggs¹³⁰ reports three highly interesting cases of panophthalmitis the result of Dengue fever. Chibret,⁸⁵ in cases of severe panophthalmitis, makes a cataract incision of the cornea, evacuates the pus, and if necessary uses the iridectomy forceps for extraction of adherent pus and shreds of purulent tissues, then injects sublimate solutions freely into the whole interior until the solution returns clear. A collyrium of cocaine and iodoform is then used, and a compress-bandage. The injection is repeated for two days.

56. *Surgical Operations upon the Globe.*—The conclusions reached by Frost⁴¹ in his thoughtful analysis of the comparative merits of enucleation, evisceration, etc., are thus stated: 1. That enucleation is safer than either simple evisceration or Mules' operation in respect of the sound eye and probably also of the life of the patient. 2. That in respect of the latter it can be rendered still safer by taking antiseptic precautions and ensuring free drainage from the orbit. 3. That by Mules' operation a good stump may be obtained with certainty, while in enucleation it is occasionally defective. 4. That by combining enucleation with the introduction of a glass sphere into Tenon's capsule, it is probable that we shall obtain the safety of the one operation with the cosmetic effect of the other. Crouzefeyte⁸⁶ concludes that, if carried out under antiseptic precautions, enucleation is not a dangerous operation, even during panophthalmitis. Becker²⁷ was stimulated to experiment with exenteration by the increasing number of cases of meningitis, and even death following enucleation. The danger of meningitis, is greater if the operation be undertaken during panophthalmitis, and for a year all such cases had been treated by the method of exenteration; but the statistics give a doubtful answer. He thinks the operation almost painless. Arlt had replied to his queries that in over 1000 enucleations by himself or assistants there had not been a single fatal result. From the report of Dr. Pulido, of Madrid, Spain, we learn that Dr. Osio has had a death resulting from enucleation of a panophthalmitic eye, and Lang⁴¹ reports a

death from long-continued meningitis after enucleation. Cheat-ham,¹¹⁰ on the whole, thinks Mauthner's rule as to enucleation is the best. It is this: "Enucleation may be performed as a preventive. It must be performed in the stage of irritation; it cannot be performed in serous or in plastic iritis; it can be performed in plastic irido-cyclitis, provided the eye causing sympathy is totally blind, but not in a state of violent irritation." Mr. Cross⁴¹ reports a case of sympathetic ophthalmitis occurring four months after evisceration, and one of slight sympathetic iritis, from the presence of the glass ball after evisceration. Both cases recovered. From thirteen evisceration operations followed by the insertion of a glass ball, Carter, in a careful paper, concludes that "we are indebted to Dr. Mules for one of the most remarkable and valuable improvements in modern ophthalmic surgery." He further says, "In the cases that to some extent were failures the results were infinitely superior to any that could have been gained by enucleation. The stumps are certainly inferior to those containing glass balls, but to those only. When the operation has been successful, I can only describe its results as perfect. There is no apparent difference between the mobility or position of the two eyes, etc." In all non-gliomatous intraocular tumors, he thinks the operation advisable. He does not think with Knapp that the mobility is only temporary. No intolerance of the glass ball is noticed by the patient, one of whom has worn it for nineteen months. Dr. Renton⁶² has had perfect success with evisceration and artificial globes. Keall⁴¹ also reports two satisfactory results from the use of silver globes instead of glass. In one case it was extremely fortunate that the metallic globe was used, as the child received a severe blow upon the eye that would undoubtedly have broken the glass had it been there. Keall believes the tissues tolerate the silver fully as well as the glass. Mules⁴¹ reports another successful case. His method of operation is thus described: The incision is made through the conjunctiva around the cornea, elliptical, with its long axis horizontal. The conjunctiva is dissected back for a short distance, and an elliptical incision made through the sclera of about the same size and in the same position as that in the conjunctiva. The contents of the globe are then carefully cleared out, which is easily determined by the view of the white sclerotic in the interior of the eye. The glass ball is then introduced, the edges of the scleral wound carefully

fitted together over the ball, care being taken to have no tension at the point of union, united by sutures, and the conjunctiva then brought together and sutured. There may be considerable reaction and some pain, which is treated in the usual manner.

Mr. Lang⁴¹ advocates the insertion of artificial globes into Tenon's capsule after excision of the globe. No suppuration had occurred in sixteen cases. It is said¹³¹ that Taylor has performed the operation of excision of the optic nerve thirty-one times "with gratifying results." To prevent the reuniting of the divided ends in this operation, Briggs⁴³ has invented a new instrument whereby the division of the nerve at two points, with consequent excision of a piece three to four millimetres long, is made at one stroke. He has used it three times, with no recurrence of pain in two of the cases. May⁴³ reports a failure, under all apparent chances of success, of the attempt to transplant a rabbit's eye into the human orbit. Another similar failure is chronicled by Bradford.⁴³ Baraban and Rohmer⁸⁵ relate their failures with animals. Cases of self-enucleation are given by Mackinlay,⁴¹ Crouigneau,⁹⁶ and Fulton.¹² D'Oench's report⁴³ of 500 enucleations by Dr. Knapp has been somewhat startling from the statement that there are on record thirty cases of death from enucleation. Of 70 cases of removal shortly after injury, 48 were on account of a foreign body in the interior, and in 8 of these there was an unsuccessful attempt to remove the body,—a discouraging record. Next to injuries, the most common cause of removal was tumors, 18 gliomata, 30 staphylomata, and 9 sarcomata. Seventy-four eyes were enucleated because of a slow cyclitic process, 40 from phthisical eyeball, 8 from painful stump. There were 41 staphylomata, 8 of glaucoma, 6 ossification of the choroid, etc. Secondary hemorrhage was noted in 20 instances, in 6 of which it was only controlled with difficulty. Removal during panophthalmitis took place in 21 cases, and in 20 it was followed by little or no reaction. There was sympathetic irritation in 51 cases, relieved at once by the operation. The interval in one case was 40 years, and in another 33, etc. Of genuine sympathetic ophthalmia there were 21 cases, and the result of the study of these cases is held to controvert Mauthner's dictum. The results obtained were good in simple plastic iritis.

INJURIES OF THE EYE.

57. Landesberg¹⁹ chronicles a noteworthy advance in the surgical treatment of *scleral staphyloma of traumatic origin*. The cyclitis that followed the excision of two staphylomata in his early practice convinced him that this method was wrong. He therefore tried multiple puncture to produce contraction by the cicatrices. This, though successful, was tedious, and was modified by excision of a wedge-shaped portion of sclerotic tissue one to two millimetres wide from the border of the staphyloma. In large staphylomata several pieces were thus excised. The healing was much quicker and the general results were uniformly successful in thirteen cases. Hull² believes that in *wounds of the sclerotic* it is unnecessary to suture the sclerotic itself, since perfect apposition may be obtained by suturing the conjunctiva only. Those having much practice among the industrial classes, where injuries to the eyes from foreign bodies are frequent, should have their attention called to the review of the subject by Grossmann.⁹³ Cases from his private practice illustrating the methods of treatment are given, among them one of iridodialysis from *concussion*, the blood from the torn iris filling the anterior chamber. Eserine was given persistently (?), and a double pupil was found to exist when the media cleared: the iris was not responsive to light. In another case the iris was wholly torn away, and the lens in its capsule lying in the anterior chamber. There was also a rupture of the sclerotic. Patient refused to have the lens extracted.

The case of Post¹² has been referred to, where there was rupture of the optic nerve at the chiasm, the result of a blow. In Bettmann's case³⁴ of persistent hemorrhage in the anterior chamber relief was finally attained by the internal administration of ergot. A remarkable concussion result was the case of Mules,⁷—"Papilla, with an irregular margin of sclera, forced out and destroyed; central artery reduced to white lines, vein retaining its normal patency." Multiple ruptures of the iris and two colobomæ of the choroid, one directly through the macula, were the consequences of concussion in Franke's case.¹⁸ In Philipsen's case¹⁸ (kindly reported by Dr. Eklund) the inferior rectus was divided by a *traumatic lesion*, and the divided prolapsed peripheral end of the muscle (the other end could not be found) was put back in the wound.

The resultant diplopia and squint remedied themselves entirely. A more interesting case was that of a boy who ran a stick in the inner corner of one eye. Pupillary dilatation was at once noted, and later a corneal ulcer appeared upon an insensitive part of the cornea. There was some proptosis, diminished motility of the globe in all directions, and complete inability to rotate *outward*. The corneal ulcer healed under treatment, but the pupillary dilatation and immobility continued; likewise the anæsthesia of the portion of the cornea and the paralysis of the external rectus. No change in these respects in three years. The author thinks the paralysis due to atrophy of the muscle following injury of its nerve, Berger¹⁹ reports a very rare case of ocular injury from the *obstetric forceps*, resulting in paresis of the levator palpebræ and superior rectus, with ptosis, etc. There are but three similar cases on record. To these Dr. Buller¹²⁴ adds yet another,—that of a little girl who had a squinting and blind eye. Ophthalmoscopic examination showed, instead of the papilla, a white patch with pigmented margins. Upon inquiry it was learned that the labor at the child's birth had been extremely difficult, and that the eye had been found out of the orbit on the cheek, and was put back by the physician after the instrumental delivery. Von Hippel¹⁸ has probably had more cases of *ocular injury from dynamite explosions* than any one else, and his report of twenty cases is as unique as it is valuable. The face, lids, and conjunctiva were injured by superficial or deep burns, with the usual chemosis, etc. The corneæ were always covered by numerous punctate opacities, the result of the penetration of particles of sand, etc., in its superficial or deep layers. The corneal epithelium was burnt or injured in all cases. The sclerotic was seldom perforated, the cornea more frequently. Detachment of the retina and vitreous was common. Grains of sand were found in the capsule or lens in several cases, but in only one case was any considerable particle found in the vitreous. Of the twenty cases, blindness of both eyes resulted in eight, blindness of one eye in seven, the vision of the remaining eye being very much impaired. As to treatment, removal of all foreign particles that can be reached and strict antiseptic precautions are about all that can be done. Grossmann's⁹³ case was similar in many respects to those of Hippel. Shah's¹¹⁹ experiences in India with ocular injuries from explosions of chlorate of potash

and realgar, used largely in India to make toy crackers (exploded by throwing them against something), in many ways tallies with the clinical details given by Hippel. There is the peculiarity that the red particles of the realgar penetrating the corneal layers set up a permanent inflammation lasting for months or years. Mr. Flanagan's *preparation*¹²⁰ for burns of the eyeball is composed of atropine, cocaine, oleic acid, and olive-oil, in the respective proportions of 0.1, 0.05, 1., and 9. parts. The alkaloids are dissolved in the oleic acid by the use of a water-bath, and the solution is then added to the olive-oil, warmed. Noticing the comparative *infrequency of panophthalmitis from the penetration of lead particles* in the eye, as compared with other metallic substances, Rolland undertook a series of experiments in order to learn the reason. From the introduction into the vitreous (rabbits) of different metals, septic and aseptic, he concludes that neither the form nor the clinical composition of lead accounts for the comparative immunity of the eye from fatal results, but simply its asepticity, which is a result of the singeing or fire-bath it gets from the combustion of the powder generally preceding the accident. Heat, as is well known, is the best germicide. Debieyre⁴⁶ recounts the spontaneous expulsion through the original wound of a *foreign body* (piece of fulminating cap) that had pierced the sclerotic, and had been buried in the vitreous for fifteen months. There was recovery and restoration of vision. Berger¹⁹ notes the existence of a foreign body in the lens for a period of twenty years without producing cataract, or impairment of vision. There are about half a dozen such cases on record (one of twenty-eight years), and all happened to young people, the particle being small, and penetrating only the peripheral portion of the lens (through the iris), where the injury is easiest repaired, owing to the nearness of the constructive cells of the lens. In Armaignac's case¹²⁶ a thorn three millimetres by one-half millimetre was buried in the sclerotic for thirty-two years. Bowen¹⁹ had a patient in whose cornea a piece of copper one millimetre long was buried without irritation for twenty months. Cilia in the anterior chamber may be congenital. Dujardin's patient¹⁰³ had a single lash left there after a perforating wound of the cornea. In Chisolm's patient¹⁰² a rough piece of cast-iron, almost completely filling the vitreous chamber, was imbedded in the globe for two years without giving rise to special irritation. Dr. Noyes' case

presents anomalous and interesting facts. A splinter of iron had entered the eye nineteen years previously without producing other symptoms than loss of sight during this long period. Severe pain in the eye finally brought him to the physician, and a diagnosis of glio-sarcoma was made by the ophthalmoscope. Anatomical examination showed the tumor enwrapped by the detached retina, and in the tumor (not a lymph-effusion) was embedded the splinter of iron. The history of a case by Tangeman¹⁰⁶ is also peculiar. A piece of steel had been within the globe for seven years, at the end of which time there was aphakia (lens absorbed) and liquefied vitreous, but preserved vision (fingers five feet). The bit of metal was to be seen (lustrous in the light) in the anterior chamber. It was successfully removed with preserved vision. The particle had penetrated the central part of the cornea (cicatrix), passed through the uninjured pupil, and had dislocated the lens. As to how it got from the vitreous into the anterior chamber, Tangeman thinks it must have penetrated the iris, aided by the continuous inclination of the patient's head in his peculiar work. Bournonville²⁷ was successful in the difficult operation of removing a foreign body through an equatorial opening in the sclerotic by the aid of a pair of iris forceps, localizing the object by the ophthalmoscope. Peculiar is the case⁵² of perforation of the eyeball by the knot of a whip-lash that had broken off (in a circus) by "snapping" the whip. The eye had to be enucleated. A bubble of air in the vitreous, carried in by a foreign body, is also a curiosity. The case was Dr. Pfalz's,⁶⁸ and is worth mentioning for the possible mistake of diagnosis it might have caused. The real foreign body was in the posterior pole of the eye, and was removed by the help of a magnet. The cases of removal of foreign bodies by the electro-magnet reported by Minor¹⁹ are very encouraging. In one case the location of the piece of metal was not known; in the other, it was proved that the magnet, at a distance of four millimetres, could cause the movement of the fragment through the vitreous. Instances of the successful removal of foreign bodies are also reported by Sinclair¹²³ and Wolfberg.⁶⁸ The most thoroughgoing analysis of the usefulness and uselessness of the magnet for the extraction of foreign bodies from the eye that has been made since Hirshberg's epoch-making work is the study of Neese,¹⁹ based on the records of forty-two cases in the clinic of the late Professor Horner, of Zurich. The litera-

ture of the subject is also reviewed. The problem is manifestly a different one, if the bit of metal is in the anterior chamber, from what it is when in the vitreous; and it is, of course, much easier extracted if in the first. When the body is securely fastened within or upon some tissue of the anterior chamber the magnet is useless. If it be in the cataractous, softened lens, the prognosis is much better than if buried in the rigid cornea, though removal of the superficial corneal layers may render the use of the magnet more serviceable. If entangled in the capsule or iris, the forceps will render the best service. The more movable the body, the smaller, the more friable, the smoother it is, the more is the electro-magnet indicated. If the foreign body is behind the lens, two absolute prerequisites govern the successful use of the magnet: the body must be freely movable and the road to it must be a short one. The immovability of the body is the most frequent of all the causes of failure. In fifty-two unsuccessful attempts this condition was the reason of failure in about twenty-seven. Since bodies once free soon become encysted and entangled in exudative products, the advantage of early operation is evident. Localization of the particle is another important matter, in order to reach it by the shortest route possible. The most unfavorable positions are of course those in the most posterior portions. In the prognosis, unfavorable conditions will be the existence of pus; the weight of the body (not over 200 milligrammes); the retention of vision, etc. Of 154 operations with the magnet in the vitreous chamber, 47-48 cases (30½ per cent.) retained satisfactory vision, —16 cases, perfect. The (sightless) globe was preserved in 27 instances (17½ per cent.). Subsequent enucleation was necessary in 16 cases, or 10½ per cent. Utter failures were therefore 55 attempts, or 37 per cent.

Graddy⁹¹ had six patients suffering from *snow-blindness*. It was with difficulty that the men found their way to camp. There was photophobia, lachrymation, conjunctivitis, and in two cases there existed a narrow, horizontal band of superficial keratitis. The patients described their feeling to be as if enveloped in a white, heavy fog. With ocular rest normal vision returned. (Reference may be made to the epidemic (so-called) of snow-blindness happening among some laborers in the Caucasus, who were clearing away snow-drifts in the sunlight. There were some seventy cases.

thirty of whom were unable to find their way home. There was intense photophobia, etc.). Dr. W. Norton Whitney, of Japan, kindly forwards us reports of seven cases of *retinal injury* occurring to Japanese students, *from exposure to the sunlight* during the last eclipse. There was no case of extreme injury, but there was conjunctivitis and more or less extensive central scotoma in every case, with generally lowered acuity. Ophthalmoscopic examination showed a pearl-white spot at the macula in all cases. Dr. G. Martin⁶³ publishes a lengthy article to prove that ocular injuries caused by the electric light are due to the intensity of the light, and not to the peculiar chemical quality of the rays. Phillips⁷ reports a case of injury by exposure of the eyes of an electrician to the light of a powerful electric arc for about four minutes. Nothing abnormal was noticed for four hours, when there was great pain, photophobia, and complete blindness. This continued for five days, when the corneæ were found to be studded with small ulcers. The ophthalmoscope showed no lesion of the fundus. There was recovery in two weeks. Knies' case¹⁸ of *ocular injury from lightning* is an instance of a rare condition. The direct or immediate consequences were the burning of the lashes, the flesh-wounds made by the electric current, and the damage done the muscular and nervous tissues. The mediate results were iritis, eyelitis, the cataracts, etc., following shortly afterwards. Ocular motility was perfect, a normal pupil, and complete blindness. One of the cataractous lenses was subsequently removed, but it is not known with what result as to vision. Silex¹⁹ adds the details of another case of the ocular consequences of a stroke of lightning, and reviews the reported cases. They now number about twenty-five, and of this number, cataract followed in ten cases, which was binocular in six. In the case of Silex there were no external injuries, and the only permanent injury of the eyes was the cataracts. The opacification of the lenses in such cases is said to be brought about by the "catalytic action" of the electricity!

SECTION IV.

FUNCTIONAL DISORDERS.

58. *Nystagmus*.—Mr. Nettleship²¹ incidentally asks whether in certain cases a congenital (or infantile) amblyopia produces the nystagmus, or whether the nystagmus causes (or perpetuates and heightens an existing) amblyopia. On the one hand, we may suppose that if central vision be defective at birth, so that the infant has less than the natural inducement to learn accurate fixation, the development of the cerebral mechanism for the coördinated movements of the eyes will or may be arrested, and uncontrollable movements of the eyes result. On the other hand, if we can suppose a child born with perfect eyes, but with rapid nystagmus, there seems no difficulty in supposing that its full acuteness of vision may never be developed, and for two reasons: the best part of the retina, the fovea, is not used continuously for fixation; whilst the impressions on successive parts of the retina are too brief to be well separated, and the effect will be more or less continuous vision of varying clearness. It is possible that the two conditions, slight perhaps at first, may thus react on each other to make both more chronic and more exaggerated. The suggestive question is asked, if nystagmus in patients with an history of ophthalmia neonatorum, but without leucomata, may not be due to astigmatism caused by the ophthalmia reacting on the growth or form of the cornea. Jeffreson's theory⁴¹ of the etiology of *miners' nystagmus* is that the affection is caused by an ill-nutrition of the visual centres arising from an interference with the vascular supply of those parts supplied chiefly by the basilar arteries. The cramped position of the miner whilst at his work, and especially of the head and neck, tends to interfere with the free transmission of blood by these arteries, and there is also a probable pressure of the tentorium cerebelli upon the pons from the same abnormal position, whence a further interference with the function of the cerebellum, or the centre for muscular coördination. This theory of the central origin of the affection may also serve to explain the constitutional symptoms always present to a greater or less degree, such as headache, choric movements of other muscles besides the ocular, fluttering at the epigastrium, malaise, pains, etc., etc. The theory,

of course, runs counter to those of Taylor, Snell, Dransart, etc., who find the explanation to consist in purely local myopathies.

Taylor (S. J.) appositely asks⁴¹ if the bad light in which the miners work, causing intense straining to fix objects, may not be a prominent etiological factor in producing the affection. Dr. Fere³⁶ found twenty-four cases of nystagmus in 170 epileptics. Mr. Jessop had a case of lateral nystagmus suddenly occurring in an old man, and produced almost entirely by looking to the left. No constitutional causes could be found. D'Oench⁴³ gives us the details of two cases of monocular vertical nystagmus of such low degree that but for the ophthalmoscope it would not have been noticed. No facts could be learned to throw any light on the etiology. The rarity of monocular nystagmus and the fact that when found it is vertical, are both points worthy of notice, as also the further fact of excellent vision in the affected eyes. It is thought that the congenital defect of vision usually associated with nystagmus is not true of the lower degrees of nystagmus. The origin of the trouble seems therefore central, some disturbance of function of the coördinating centres governing the combined movements of the eyes. The results of the paper of Gowers² led to a conclusion that the mechanism of nystagmus might consist in a disturbance of the mutual action of opposing centres. There is a tendency, probably, to intermission of the centre, which is normally restrained, and the contraction rendered uniform, by the mutual dependence and control of the opposing centres. A case was mentioned of disease of one side of the pons, with loss of the movement toward that side, in which there was nystagmus in the movement toward the opposite side. The study of palsies of the sixth nerve throws light on the origin of nystagmus, reducing it to the causation of the intermissions of the primary contraction; given intermitting contraction and the return movement, the oscillation necessarily followed. Hughlings Jackson said he had long held that nystagmus signified paralysis; there was loss of some movements and development, sometimes to excess, of other movements of the same muscles. The phenomena of after-movements in riding in cars might be called "nystagmus in the making." The paralytic element consisted in temporary exhaustion or atrophy of some cells of the lowest motor centres, with over-development of others. Other facts connected with hemiplegia, etc., were consonant with this theory.

59. *Visual Disturbance of Function*, without discoverable lesion and without discoverable connection with pathological changes elsewhere in the organism, is fast disappearing. *Night-blindness* (hemeralopia) is usually found associated either with ametropia or with retinitis pigmentosa, or with deficient vascular supply or quality. A few such unexplainable cases occur to every practitioner. Thus Featherstonehaugh¹² reports a case that, three years after all corrections of ametropia, etc., have been made, has the same inability to see objects in a dim light. There are so many possibilities of rational explanation of such cases that, even if the practitioner have the requisite knowledge and skill in diagnosis to unravel them, time may often prevent, and the cases drop into the category of the unexplainable without properly belonging there. Besides the causes above mentioned, yet other extraneous causes may result in hemeralopia. It is usually present in syphilitic retinitis, the ophthalmoscopic signs of which may be unobservable or unobserved; in scurvy, an affection, according to Da Costa, to be found, even in aristocratic circles, more frequently than is supposed; in snow-blindness, or temporary exhaustion of the retina or visual centres from any cause; in hysterias, etc., etc. Treitel¹⁸ confirms the conclusions of Förster and Alfred Graefe that the hemeralopic eye is an over-exhausted or tired eye; and he adds, further, that as a result of the over-stimulation there is a disturbance of the power of adaptation to varying degrees of light. This, of course, does not set out, but rather confirms, the rôle of the general system in nourishing and innervating the eye, etc. Magnus⁶⁸ had a rare case of idiopathic, *monocular* hemeralopia.

Day-blindness (nyctalopia) is a rare congenital affection associated with color-blindness and amblyopia; consanguinity is frequent. Cases are given by Nettleship.¹

Amblyopia, without discoverable lesion within the eye or beyond it, is also fast disappearing. Nettleship²¹ reviews the fact, and gives some illustrative cases. How far the existence of uncorrected hyperopia or myopia may go to explain some cases of retinal anæsthesia is a question unsolved. That irregular astigmatism often accounts for it we are certain, and that it may sometimes result from a former connection with nystagmus is also possible. That squint, idiopathically or surgically corrected, is followed by monocular amblyopia is a truism that hardly needs mention.

Anisometropia plays a part here also. Albinos are often amblyopic. Nettleship cites several cases to illustrate the probable existence of amblyopia from birth, and without ametropia or squint, etc. Such cases are of interest, and should be chronicled. Most generally, of course, ingestion of toxic substances, a reflex neurosis, hysteria, or central nervous troubles, lie at the root of the matter. Such factors will be alluded to later. Völker¹³² cites two cases of typical anæsthesia retinæ, with contracted fields, impaired acuity, etc., and irresponsive to strychnia and electricity. (A dental reflex neurosis has often been found to explain such mysteries, and, as we know, tobacco and alcohol are everywhere.) Horstmann¹³³ relates the histories of seven cases of anæsthesia of the retina due to central or constitutional disturbances. Tjelnichin⁴² cured a case of hysterical amblyopia with an application of a gold coin to the eyes. Riley's case¹³⁴ of "pseudo-epilepsy of the retina" was at once relieved by proper correcting-glasses. Königstein⁹⁵ showed preparations of a case of synchysis scintillens. There was fluidity of the vitreous, with a multitude of contained crystals of peculiar microscopic characters, but not found to be cholesterin, leucin, or tyrosin.

60. *Color-blindness*.—Professor Ramsey¹³⁵ urges the sensible view that color-blindness is an affection of the brain, and not of the eye. Nettleship²¹ alludes to the fact of the association of day-blindness with total color-blindness, and thinks that cases of total color-blindness without other defect of sight are excessively rare. Chibret, Izarn⁴⁶ and Colardeau have constructed a chromatophotometer for the accurate and speedy testing of the color-sense. The colors are produced by polarization, so that simple rotation produces any degree of saturation of two complementary shades, from pure white to complete saturation. From an examination of eight color-blind physicians Chibret concludes that,—1. The idea of color is always absent in the color-blind for a certain degree of saturation of the so-called confusion-colors. 2. The shades of confusion-colors are not the same for all color-blind persons. 3. The idea of color sometimes exist for even the most feeble saturations, sometimes for the saturations which cross from yellow-blue to red-green, passing through violet-yellow green. 4. This idea of colors is lacking in exactness, the colors seen by the color-blind person not being perceived by him as they are by persons with a normal

color-sense. 5. When two complementary colors are seen simultaneously, the idea of color exists for a less degree of saturation than where the colors are seen isolated. Hilbert¹⁹ classifies the causes of temporary color-blindness as,—1. Traumatism, causing cerebral disturbance of the visual centre similar to that produced in commotio-retinae by concussion. 2. Toxic substances or micro-organisms. 3. By any cause provoking an excessive irritability of the nervous system of neuropathic individuals,—epileptics, hysterics, hypnotics, etc. Hoor²⁰ subjects to criticism the different methods of examination proposed for testing the color-sense, particularly of those examined for military service. The method of Wolfberg, a combination test for acuity—white light—and chromatic sense at one time (see Graefe's "Archiv," xxx), gives too indefinite results, and requires conditions of light not always to be found. Of all the plans he thinks the method of Stilling (letters printed in various colors) the best. Rudall¹³⁶ argues for a more thoroughgoing examination of railway and marine employes, as regards not only the color-sense, but also as to the visual acuity, the extent of the field, and the more pronounced anomalies of refraction and accommodation. Legislation should be explicit in these particulars and in prescribing the methods of examinations, the competency of the examiner, etc. As a result of the color-test made of the employes of 79 German railways, it is stated¹¹ that of 104,743 persons tested from April 1, 1882, to July 1, 1886, 850, or 0.81 per cent., were found to be color-blind. Of 239,726 persons tested up to July of last year, 1934, or 0.81 per cent., were color-blind; while in 145,456 officials and other servants employed on the seventy-nine railways on July 1, 1886, 100 were entirely and 441 partially color-blind,—a percentage of 0.37.

The third report of color-blindness in the (English) mercantile marine service has called forth that criticism³³ of the rules governing the matter which is well deserved. None are more convincing than the admirable lecture by Mr. Bickerton.⁴¹ He estimates that there are at present in the mercantile fleet of England 4593 color-blind men holding positions in which the correct interpretation of colored lights is essential. Questions were put to the Liverpool ship-owners to elicit their opinions as to whether a color-blind man should have control of vessels, and whether a color-blind man was fit to be on the "lookout." The answers are significant: 8 would

not answer, 110 replied no to both questions, and 14 gave qualified affirmative answers. Bickerton says he has found about 55 color-blind boys being educated for sea-life. Anecdotes are given illustrative of the dangers narrowly averted and constantly run by the retention in service of color-blind pilots, etc. Dr. Argyll Robertson¹¹ emphasizes the need not only of a preliminary examination, but also of periodic examinations, because of the growth of amblyopic affections caused particularly by tobacco. Such failure of color-sense may develop at any time. Dr. Williams¹⁰⁰ also urges the great importance of reexaminations. From Thomson's paper²⁵ concerning color-blindness among railroad employés, it is found, according to the reply submitted to the German Government through its minister, and the Surgeon-General of the U. S. Army, that the total number of employés of the Pennsylvania Railroad examined (lines east of Pittsburg) amounts to 25,158. Of this number 481 were color-blind, 661 had defective vision, and 158 defective hearing. The method of examination devised by Thomson, and adopted on all the roads of the Pennsylvania system, differs from that of any other in that the examinations may be made by non-professional examiners,—by any intelligent person without special education. The adoption of this method by the Reading Railroad Company followed in 1887. A conflict between the men and the company was at one time threatened, on account of the introduction of examinations for color-blindness, that gave the company much trouble. The demonstrated existence of the usual percentage of color-blind among the men, and even of total degrees among engineers, led to a realizing sense of the dangers run by both public and corporation in the retention of such employés. Thomson's entire system of examinations for color-sense, acuteness of vision, accommodation, and field of vision has been put in force on the London and Southwestern Railroad in England.

Baker¹⁰⁶ calls attention to crudities in the Ohio law regulating the examination of railroad employés, whereby injustice is done the men. Heilbert²⁷ reports a case of *chromatophobia*, or dread of colors. Nine cases are now on record, red being the color disliked in 6 cases, blue in 2, and white in 1. All the cases were patients of a certain neurotic type of temperament. Williams¹³¹ had a case of *chromatopsia* with white optic atrophy. The color of all objects

seemed to be a commingling of pink and green colors. Heilbert's case of *erythropsia*⁶⁸ is peculiar in the fact of the trouble not appearing for a year after cataract-operation, and that it lasted but for an hour, with recurrence two days later. The outbreak was preceded by mental disturbance, which tends to corroborate the view of the central origin of the trouble. Purtscher¹⁹ publishes six cases.—four aphakies, and two had normal lenses. In two patients objects became green when entering a closed room from the open air. He concludes that dazzling is the immediate or exciting cause, either from too much light, from laying aside colored glasses, etc. Szili⁶⁸ defends the theory that erythropsia is a purely retinal affection, citing confirmatory illustrations, especially a case of monocular erythropsia.

SECTION V.

MEDICAL OPHTHALMOLOGY.

61. By the term Medical Ophthalmology we understand that part of the study of ophthalmology concerned in the pathological relations and interdependencies of the eye and the rest of the organism. Its field is the overlapping area of ophthalmology and general medicine, and an understanding of the laws of the clinical relations of the two is necessary alike to the specialist and to the general practitioner. We have accordingly reserved for this place the mention of all such ocular troubles (reported during the year) as are induced by abnormal conditions not distinctively ocular, or that are themselves the origin of extra-ocular disturbance. It is useless to conceal the fact that the boundary-lines of this common territory are not accurately established. It is, for example, the writer's belief that many of the clinical facts just reviewed, such as color-blindness, erythropsia, hemeralopia, nystagmus, etc., will find their final explanation very often, if not always, in cerebral disturbances, organic or functional. But such questions are yet *sub judice*, and they have been left out of the count. On the other hand, it may transpire that reporters of cases have failed to recognize ocular causes that were sufficient to explain the facts, and, as in the fairy tale, have sought abroad the Prince they left at home overlooked. The order of the arrangement will be the natural one:—

I. Affections induced by the intermediation of continuous or contiguous tissues;

II. Those induced by means of the vascular system;

III. Those by means of the nervous system.

Doubtless many cases of ocular disturbances exist in which it is difficult to say if the circulatory or the nervous system is the connecting link, and often, indeed, both routes are implicated; but in a rough way the grouping will for the present suffice.

SUNDRY AFFECTIONS DEPENDING ON CONTINUITY OF STRUCTURE.

62. A curious case that may be cited here is reported by Dr. Bradford³² (a general physician) of a boy who was supposed to have *torticollis*. It was finally discovered that the head was held to one side in order to secure binocular, or better, vision. (Where is the oculist's report?) Dr. Buller¹² reports two cases of a peculiar form of granular conjunctivitis associated with *ichthyosis*. One case, a boy of fifteen, suffered from iritis two years previously, and from asthenopia six months later. Two younger brothers also had *ichthyosis*. The second was a child of seven, who had weak eyes for two or three years. The conjunctiva was swollen, smooth, pale, and glazed, with flattened elevations containing minute red dots, and extremely hard. These were found to be white, fibrous granulation-tissue. The secretion was different from that in trachoma, and was not contagious. Secondi³¹ describes the peculiarities of *leprosy of the eye*. The early stage is characterized by the formation of a little yellowish tumor in the limbus of the cornea; it is vascular and opaque; the rest of the conjunctiva is hyperæmic and catarrhal. Most of his patients (four such cases) complained of a certain impairment of vision immediately preceding the formation of the granuloma. In all cases corneal opacity was present, slight and superficial in one, but in others the corneal granulomæ invaded the deep structures, and even the iris and ciliary processes, leading to atrophy of the globe. In a case of tuberculous leprosy the disappearance of the conjunctival infiltration was followed by recurrent adhesive iritis, rebellious to all treatment. Mazza³¹ also reports a case of tubercular leprosy, with scleral and corneal tumors. A tumor of the globe was excised, but ten months later it returned with greater virulence; cauterization followed the operation this time. Vincentiis³¹ divides ocular leprosy into two classes, the

plane and the tuberos; in the latter there is a tendency to the formation of tuberos masses in the iris, which sometimes fill the whole anterior chamber. Vincentiis also notes a characteristic form, a paralytic lagophthalmos, frequently with neoplastic alterations of the nerves, whence arise changes of sensation and motility, and sometimes of paralytic keratitis. Kaponi¹⁶ reports three cases of ocular leprosy, and Buckman¹⁶ illustrates the great frequency of affections of the eye in leprosy. Dr. Reed⁶² had a case of *xeroderma pigmentosa of the eyeball* extending from the centre of the cornea to the equator of the eyeball. The microscopical examination of the removed tumor, and of the nodules of the face and hands, showed the same typical pearly node. The skin affection (not hereditary) began when the boy was two years of age.

Schmidt-Rimpler³⁸ reported a case of *pemphigus of the conjunctiva* which seems to have certainly been consequent upon the skin-disease. There had been an eczematous eruption of the arms and legs, followed by pemphigous vesicles on the feet and legs; these spread over the body, and eventually became localized on the eyelids, and the conjunctiva then became affected. There was slight ptosis, ectropion of one lower lid, and absence of lashes; symblepharon and injected conjunctiva. There were no vesicles on the conjunctiva, but synchronously with the skin eruption there was a serous infiltration of the symblepharon and yellowish deposits in the conjunctiva. He had noticed similar processes associated with lupus and ichthyosis. Tilly's case¹² of pemphigus with essential shrinking of the conjunctiva and persistent symblepharon followed vaccination, and the appearance of bullæ on various parts of the body, with loss of the eyes. Abscesses of the mother's breasts, from inoculation with pus from the eyes of the nursing babe with ophthalmia neonatorum,⁵⁵ have been noticed, and do not, perhaps, class themselves here, but may, from their uniqueness, be mentioned. Weiland¹³⁷ had a case of complete blindness of one eye following *erysipelas*. There was optic neuritis, opaque papilla, disappearance of arteries and vessels. The recovery was slow, and following injections of pilocarpine and strychnine. Dufour¹³⁸ notes the fact of an infectious conjunctivitis being set up by nasal erysipelas through the lachrymal canal, and Rampoldi⁶⁹ has seen pannus caused by erysipelas of the face. Dr. Gradle³⁴ says, "I recollect a number of cases of eye-disease

either kept up or originated by nasal trouble. The first of these is a pseudo-erysipelas of the lids, which is not an infectious disease, but merely a secondary affection of the blood-vessels, only resembling erysipelas clinically. It is entirely due to the irritation and engorgement of the blood-vessels in the front part of the inferior turbinated bone." Ware³⁴ had seven cases of *lupus vulgaris* of the eyelids. Ziem¹³⁹ had a case of abscess of the lower lid following as a direct result of periostitis of the root of an adjacent tooth, with suppuration.

Dr. Gradle³⁴ reports that "a type of nasal affection giving rise to eye trouble is true periodical *hay fever*, and a non-periodical irritability of the nose resembling hay fever. I have published four cases, and have since seen another, of periodic conjunctivitis characterized by the formation of granules and follicles, which trouble always receded in winter, to reappear again in the spring or summer. In two of these cases a diagnosis of hay fever has since been made. I have seen a case which had been treated for trachoma by a number of specialists, where the history of the nose showed that the affection was of nasal origin."

Martin³¹ says the *epistaxis* of school-children is an affection in the etiology of which the eye-strain of the effort to correct astigmatism often certainly plays a part. Gayet⁸⁵ had a case of infectious panophthalmitis that was preceded by inflammation of the cavity of an extracted tooth (left upper canine), which inflammatory swelling extended to the left eye, with loss of vision, and, finally, loss of the eye. Nieden⁴³ discusses the connections between *nasal and ocular disease*, in which, *inter alia*, we are glad to see that an attempt is made to balance accounts, since he finds that the development of chronic rhinitis into ozæna is largely due to the absence of the regular lachrymal secretion from stricture, etc., of the duct. Ozæna, again, may have a noxious influence upon affections of the cornea. It is said that phlyctenular keratitis "almost invariably has its origin in a disease of the nose." Four cases are detailed, illustrating other relations: 1. Polypus starting from the upper portion of the nostrils, first perforating the median left, and then the right orbital, wall; bilateral exophthalmos; death. 2. Myxo-sarcoma of superior nasal sinus penetrating ethmoid and orbital wall; neuro-retinitis; double exophthalmos, amaurosis, death. 3. Chronic empyema of frontal sinus

and ethmoid labyrinth; rupture into orbit, etc. 4. Hypertrophy of nasal mucous membrane; empyema of Highmore's antrum; neuralgia, blephorospasm, cure after cleansing of cavities.

Despagnet¹⁶ has seen two cases of *pediculis pubis* of the lashes and brows.

DISEASES ARISING FROM THE MEDIATION OF THE VASCULAR SYSTEM.

63. *Nutrition of the Eye; Pathogenesis of Cataract.*—The experiments of Panas⁸⁵ go to show that not all rabbits are equally liable to ocular disturbances by the ingestion of naphthaline; that when the naphthaline sets up no precedent retinal trouble, cataract does not take place; and that the star-like crystals of lime are found, regardless of the food given the animal during the naphthaline experiments. The choroid takes part in the dystrophic disturbance only late and partially. The general conclusions are that the pathogenic materials—crystals and leucocytes—are carried in the physiological current, by the way of the optic nerve, toward the interior of the eye, provoking, first, a liquid accumulation between the retina and the hyaloid and between the retinal layers, thence penetrating the vitreous, and thus reaching the crystalline, where it produces cataract by nutritive disturbances. It is well known that chorio-retinitis is the chief cause of so-called symptomatic cataract. The author hazards the suggestion that there may be a causal relation existing between retinal detachment and cataract by similar processes of disassimilation. In the retina there is a formation of infiltrated plaques of retinal inflammation and deposit that may be discrete, umbilicated, confluent, or may proceed to the ultimate stages of disorganization, as in a typical plastic chorio-retinitis. In the crystalline, vacuoles are formed in the equatorial perinuclear zone, disassociating the fibres, and infiltrated with fine granulations; later, these extend anteriorly and form a vertical furrow, the invasion of the posterior pole follows, until finally hydropsy of the tubes and the formation of myeline masses ends the general disorganization. The lithographic plates in color given herewith show the appearances thus briefly indicated.

64. *Anæmia.*—Cases illustrating the ocular troubles resulting from impaired quality or deficient quantity of the blood are numerous. The most important clinical report of this nature is

Nutrition of the Eye (Paras)



Duck & McEvedy, Lish, Photo

Fig 1. *Synchysis scintillans* Brilliant moving flecks

Fig 2. Appearance of glistening retinal spots.

Fig 3. The same with depressed centres.

Fig 4. Islets formed by the fusion of the preceding.

Fig 5. Final changes, complete disorganization of the retina and vitreous

Fig 6. Lime crystals found in the retina and vitreous.

that of Kubli,¹⁹ who gives the details of the extensive *hemeralopia* occurring among the people of Russia during the Easter Church fasts. In one hospital, from 1882 to 1887, there were 320 such cases. During the long season no meat is eaten, unless it be liver, which is not considered to be meat, and many patients have an annual recurrence of the ocular affection so soon as the fast begins. Youth predisposes: out of 200 cases of men there were 61 each from 10 to 20, and from 20 to 30 years of age; 43 from 30 to 40; 18 from 40 to 50; 12 from 50 to 60; 5 from 60 to 70. Pregnancy predisposes, but the majority affected are males. Retinal insensitiveness to light of low intensity was the prevailing symptom. With Forster's photometer 15 patients had less than one-half the normal reaction, 9 less than one-tenth, 11 less than one-twentieth, 8 less than one-fiftieth, and 7 less than one-hundredth. No therapeutic measures were of avail except the resumption of a nourishing diet. Concurrent with the hemeralopia there were often also other signs of ocular trouble, such as blepharitis, conjunctivitis, epiphora, keratitis, etc. There were 4 cases of erythropsia from the same cause. Mackenzie¹⁴⁰ finds that the danger of retinal hemorrhage in anæmia is not a consequence of the kind, but of the degree, of blood poverty. It has been supposed that these hemorrhages are particularly characteristic of pernicious anæmia. By counting the number of blood-corpuscles after loss of blood, etc., it is found that there is danger to the retina whenever the number falls below one-half the normal. A rough test is the pinkish tint of the finger-nails: if this is preserved, the blood has not been robbed of one-half its corpuscles. Hirschberg⁵⁷ cites a case in which multiple retinal hemorrhages, with immense distension of the veins, led to a diagnosis of *leucæmic retinitis* before other symptoms had made the general disease apparent. He says the fundus of the eye was not, as Liebreich pictures it, of an orange hue, but was red, with a delicate gray shimmer. The white corpuscles were about as numerous as the red, spleen not enlarged; history of syphilis 13 years previously. It is said that 126 cases of leucæmic retinitis are on record. Dr. Martini¹⁰³ found that the long fast of 30 days by Succi had no effect upon the eyes beyond a diminution of visual acuity in the left eye; the right remained normal in every respect.

Immermann¹³⁷ describes a case of complete blindness following

profuse diarrhœa. The patient believing himself infested by a tape-worm had obtained calomel, jalap and extr. filix-mas, and took them in enormous doses. The exhaustion resulting from the diarrhœa brought on complete blindness in three days. There was no intestinal hemorrhage; ophthalmoscopic examination gave a negative result. The only ocular disorder visible was *stabile mydriasis* and blindness. Optic atrophy followed in five weeks. No other senses implicated. Ziegler's¹⁴¹ examination *ante*, and *post-mortem*, of the eyes of a man dying after a severe duodenal hemorrhage showed, while living, pallor of the papilla and whitish discoloration of the adjacent parts, narrowed arteries and tortuous veins, with slight retinal hemorrhage upon one side. The microscopic examination showed fatty degeneration of the nerve, and of the nerve-fibre and ganglion layer of the retina, most pronounced near the papilla. Horstmann¹³³ traces to deficient nutrition the anæsthesia retinæ of seven patients, whose eyes were objectively normal, but whose fields were concentrically diminished, and whose central visual acuity was impaired.

Ulrich's five cases¹⁸ are full of interest. Four were in consequence of great intestinal hemorrhage and one was a case of pernicious anæmia. Headache, swooning, tinnitus aurium, restlessness, etc., were present. The ophthalmoscopic examination showed in every one of the cases of hemorrhage a peculiarity of the papillary veins that the author emphasizes, consisting of a loss of the dark-red tint characteristic of them upon the retina, and instead, a quick change, at the papillary edge, to a bright-red hue. This peculiarity was accompanied by retinal hemorrhages. The arteries were narrow, the veins beyond the papilla dark, tortuous and engorged. Arterial and venous pulsation were easily produced. The circulatory phenomena are explained as resulting from a decrease of the quantity and of the pressure of the blood in the general system, the increase of a hindrance to the intraocular circulation by the angle the vessels make at the papilla, and by the intraocular pressure. Extraordinary transparency of the blood is also noticed. In the case of pernicious anæmia, that finally caused death, there was in the early stages no retinal hemorrhage, but, late in the disease, the typical picture of the vessels presented itself and slight hemorrhages were noticed.

Jeaffreson⁴¹ ascribes to deficient blood-supply of the visual

centres caused by the miner's position whilst at work, as also to the pressure of the tentorium upon the pons, also caused by abnormal position, the chief etiological factor in the production of that grievous affection, miners' nystagmus.

Rampoldi⁸⁵ has recorded the ocular symptoms and troubles consequent upon the Italian disease, *pellagra*,—an affection caused by the lack of proper nourishment. Taylor⁷ had a lady patient afflicted with squint from an endeavor to reduce her flesh by diet, etc.

65. *Retinal Hemorrhages* resulting from *atheromatous degeneration* of the arteries are illustrated by twenty-three cases gathered by Delalande.⁸⁶ They comprise cases of hemorrhage without other cause or complication, and also cases with concurrent albuminuria, and comprise examples of hemorrhages occurring in the optic nerve, retina, choroid, etc., as well as others of miliary aneurisms of the retina, emboli of the arteria centralis, and hemorrhages following cataract. Eales⁴¹ has stated that constipation appeared to be constantly present in those who were liable to recurrent hemorrhages into the vitreous. Nieden²⁷ describes a case of cataract in a young woman with an intercurrent telangiectatic condition of the capillaries of the face. Nettleship²¹ describes a case of *retinal embolism* following severe attacks of giddiness, vomiting and prostration. The patient had aortic disease and mitral regurgitation. Another case of Nettleship²¹ is peculiar from the repeated attacks of failure of sight, blueness of objects, and final failure of sight altogether. *Thrombosis* of both retinal arteries excited by feeble circulation with diseased vessels, is the diagnosis. Yet another case is given of a single large retinal hemorrhage from retching. Kraske¹⁶ noticed that during artificial respiration of an asphyxiated child the pupils that were before in a condition of stabile mydriasis became contracted; he ascribes the phenomenon to a congestion of the vessels of the iris. The heart was during this time inactive, and the author says the same effect can be produced upon a corpse by the method of Sylvester. Ziem¹³⁹ has found that hypertrophied tonsils and adenoid vegetations of pharynx are often intimately connected with ocular affections, and has cured cases of palpebral, conjunctival, and lid affections, as well as epiphora, by excision of the growths. He explains the connection as being due to a disturbance of circulation in the cavernous parts of the nose, and its

consequent development in the eye. When naso-pharyngeal affections coexist with ocular troubles, it is necessary to treat the former thoroughly. Cases of *pulsating exophthalmos* are reported by Peschel and Angelucci,²⁷ in which rupture of the internal carotid in the sinus cavernosus was the diagnosis. On one case digital compression of the carotid was kept up without result for nine days, after which ligation of the artery was followed by some improvement. Clark's case⁶² was cured by ligation, the exophthalmos disappearing in four months. From the standpoint of ophthalmology, *exophthalmic goitre* may, perhaps, more fitly be classed as a disease of the circulatory system than of the nervous system. Mr. Wherry⁷ had a patient who showed Stellwag's sign (retraction of the upper eyelid) without proptosis or goitre, but with some throbbing of the carotids and cardiac palpitation. Graefe's sign (consensual downward movement of the lid with the globe) was not present. The case confirms Graefe's view of the existence of Grave's disease in women, where the only sign is rapid action of the heart and defective mobility of the lid. Drummond,⁴¹ in a post-mortem examination of two cases, found the eyes far less prominent than in life, and the orbits very well filled with fat, no tortuous vessels, nor any œdema. A peculiar bronze pigmentation of the skin about the eyes was remarked in all cases. Bobone³¹ reports two cases of exophthalmic goitre with concurrent hypertrophic rhinitis; cauterization of the hypertrophied parts is said to have entirely cured one case, both of the exophthalmos and the general symptoms, whilst the symptoms of the other case were greatly ameliorated. Dourdoufi⁷⁴ finds that section of the cervical sympathetic is accompanied by retraction of the globe, of the pupil, and the palpebral fissure, whilst stimulation of the peripheral end of the nerve has the contrary effect.

Panas⁵⁶ lays stress on the necessity in *small-pox* of opening the eyelids and irrigating all the parts thoroughly with antiseptic liquids, and calls attention to a post-variola stage of ocular trouble, less grave than the other, but which demands care. It is at the stage of beginning convalescence, when iritis frequently sets in; perhaps, also, corneal inflammation. Briggs records three cases of *panophthalmitis*, the result of *dengue fever*; the cases were not exceptionally severe as regards the fever, but, despite attention and care, the inflammation of the eyes quickly ended in blindness.

Romiée has collected 44 cases of punctate *cataract following fevers*, 17 of which were classed as due to typhoid, 7 to variola, 3 to scarlatina, 7 to chlorosis, and 10 to diverse chronic maladies. To these Fontan adds three cases following *typhoid*. The cause of their formation is thought to be the great failure of nutrition consequent upon the disease. Dr. Akino-Jiro, of the Joto Hospital (kindness of Dr. Whitney), reports a number of cases of cataract following typhoid fever. The number of cases of typhoid treated was 42, of whom 11 developed cataract. Besides these, 10 subsequently came for treatment of impaired vision, 5 of whom became worse, though not cataractous. The affection was, as a rule, binocular. Dr. Akino attributes the ocular troubles to impaired nutrition, consequent upon the fever. Gayet's case,³² diagnosticated as grave typhoid fever, proved to be an infectious panophthalmitis of the left eye. Galeczowski¹⁶ reports two cases to illustrate an important fact, viz., that the ocular symptoms of measles may precede by some days all other symptoms, in the shape of a phlyctenular kerato-conjunctivitis more or less severe. If the symptom is recognized early, it not only gives the physician a great chance to fortify the system with general treatment, but he is also able to forefend serious injury to the cornea. Trousseau⁹⁶ thinks that *measles* leads to more ocular complications than any other form of eruptive fever, not excepting small-pox. The eye is in danger at all periods of the disease, and even during and after convalescence the greatest watchfulness is required. Only the superficial membranes are attacked. The simple conjunctivitis of the early stages soon spreads, and the lids and cornea soon become inflamed, and phlyctenulæ of the cornea may end in ulceration and perforation. Without general diphtheria a true diphtheritic conjunctivitis may set in at this stage, and is almost always fatal to the eye. Boric acid solutions in the early phases of the disease, and sublimate solutions later, are necessary parts of the treatment. Baas⁶⁸ had a case of impaired accommodation following parotitis, and without diphtheria. Lubinski⁴² has studied the irido-cyclitis consequent upon *relapsing fever*. Twenty-two patients out of 640 had irido-cyclitis, followed by vitreous opacity. Females were not affected, and the patients were adults. The ocular affection follows the fever in about a month or two. He classes the cases he has observed in three categories: 1. The slight form, characterized

by inconsiderable visual troubles, a little hyperæmia of the papilla, etc. 2. Pronounced inflammation of the ciliary body, accompanied at times by iritis, with slight posterior synechiæ. 3. Predominant iritis. The form of ocular trouble seems to have no connection with either the intensity of the fever or the number of attacks. Bull⁴³ is reported as giving the histories of seventeen cases of intraocular hemorrhage that showed some connection with *severe malarial poisoning*. The vessels ruptured during the febrile stage of the disease. Constitutional treatment is alone effective, pilocarpine or the electric current being of no use in his hands. Javal,⁴⁶ from the presence of interstitial keratitis in patients suffering from intermittent fever, was able to tell from what part of the country his patients came from, knowing the malarial districts. Quinine was the effectual remedy. Landolt⁴⁶ agrees with Javal, and Poncet goes even further; has seen in Africa hemorrhages and choroiditis result from the same cause. Some American writer, whose reference has been mislaid, has during the past year noticed the important part played by malaria in producing ocular troubles. Sedan¹⁶ gives the result of thirteen years' experience in Africa, during which time he had 34 cases of interstitial keratitis, 19 monolateral, and 12 bilateral. In only 11 of the 34 was syphilis the cause, and in 27 the malarial origin was demonstrated by the quick response to antifebrile and tonic treatment.

66. *Gout and Rheumatism*.—Zychon¹⁶ has made special studies on the ocular manifestations of gout. Scleritis is the typical gouty affection of the eye, though the lachrymal ducts are often attacked, and indeed all parts of the eye. Encysted calcareous deposits (urate of sodium) along the upper-lid-edges are of very frequent occurrence. So long as the small, white papule does not break through the conjunctiva little annoyance is felt; but so soon as these ulcerate and protrude there ensue inflammations of the conjunctiva and cornea, with the usual attendant symptoms of photophobia, lachrymation, etc. True pannus may be superinduced. The little calculi may be picked out with a delicate-pointed instrument, and this is the proper treatment. A scaly eruption of the lids is also a sequel of the gouty condition, and this eczema may give much trouble from the attendant itching. Mercury, in the form of calomel insufflation, or in ointment, is the best remedy. A form of conjunctivitis generally coexists with this. When gout

attacks the iris and ciliary body glaucoma is sometimes set up. The choroid and retina are also not exempt, and complete atrophy of the globe may follow. Sub-conjunctival extravasation of blood has been noticed, and is valuable as indicative of the general systemic condition. Intermission is characteristic of ocular gout. Jonathan Hutchinson⁴¹ believes that inherited gout has its share in cases of hemorrhagic retinitis, by leading to weakness in the walls of the blood-vessels. There is most always a history of gout in families where the hemorrhagic diathesis is pronounced. Boucheron⁴⁶ says the symptoms of gouty or rheumatic cyclitis vary according to the part of the ciliary body attacked. There is tenderness and pain of the ciliary region, leading sometimes to neuralgic or cephalgic radiation; troubles of the accommodation, non-correctible by glasses,—often mis-called “spasm of the accommodation;” slightly augmented tension at times; floating spots in the vitreous, or even slight hemorrhages there. The exacerbations may be coincident or not with those of the articular or muscular crisis. To the indicated local treatment should be added the general attention to the systemic disease. Panas⁹⁶ speaks of the frequency of sclero-choroiditis of gouty or rheumatic origin, and recommends a combination of the salicylates of lithium and of sodium as more effective than either alone. Mauriac⁴⁶ calls attention to the coexistence of a benign conjunctivitis, easily subdued by treatment, with rheumatic blennorrhœa. Its particular symptom is a severe injection of the conjunctival capillaries.

67. *Diphtheria*.—Alt's report¹² of nine cases occurring in his practice leads to some doubt whether the disease is as necessarily combined with diphtheritic processes elsewhere as has been supposed. All were cases in children except one. One child died; there was sloughing of the cornea in 4, leucoma of the cornea in 2, and the remaining eight eyes of 6 patients got well altogether. When the diphtheritic membrane was not large, or during its development, nitrate of silver was at once used. The quickest and best result was in one case where continued instillations of corrosive sublimate and boric acid were kept up. The opinions of Graefe and of Hirschberg concerning the disease are given in the report of Alt. Trousseau⁷² describes a case of diphtheritic conjunctivitis in a child, in which the only points attacked were the eyes and the prepuce. The child was syphilitic and died. Fox⁵⁴

was able to control a severe case with already existing double perforation, etc., by the use of powerful antiseptic lotions; thus preserving some visual power for the patient. Gillet de Grandmont⁹⁰ reports a case of diphtheria transmitted from the pharynx to the eye and from the eye to the pharynx. The infant had contracted the disease of the eye from the older brother, in whom the throat alone had been affected. From the infant the mother caught the pharyngeal type. Changarnier's case¹⁶ of diphtheritic conjunctivitis was connected with a severe case of croup in the child; the eyes were saved by antiseptic treatment. Coppez³¹ emphasizes his conviction that the case he reports was not one of croupous or gonorrhœal ophthalmia, but a veritable diphtheria, attacking both eyes at once, and producing the characteristic yellowish lardaceous chemosis of the conjunctiva, with fibrinous membrane, etc. Gangrene of the cornea was imminent, and was only prevented by lemon-juice instillations, a remedy much praised by Fieuzal, which effected the absorption of the fibrinous exudate without corneal perforation or even opacity. (Remak has studied the diphtheritic paralyses of the ocular muscles in the *Centralblatt*, June, 1886. See, further, *Muscular Paralyses*.) Zieminski¹⁶ had seventy cases of croupous ophthalmia in one year, among about 9000 patients. Almost all of these were scrofulous children. No case was complicated with gonorrhœal or granular affections. The disease is seldom very serious, corneal ulcers rarely occurring. An iodoform ointment is the main reliance.

68. *Tuberculosis*.—The predisposition of scrofulous children for croupous conjunctivitis is shown by the report of Zieminski;¹⁶ among seventy cases sixty-seven of the children were plainly scrofulous. The case of Reuss,⁹³ tuberculosis of the conjunctiva, is rare. The patient, 66 years of age, was of tuberculous parentage, and he himself had chronic tuberculosis of the lungs. The eyelid was the seat of granulations and a large abscess. Giant cells and the typical bacillus were found in the ulceration. A similar case is reported by Verrey.⁴¹ Stölting¹⁸ treated three cases by excision and subsequent cauterization, all with good results. Rampoldi⁶⁹ had a case of a large ulcer of the palpebral conjunctiva in a patient with demonstrated pulmonary tuberculosis, but by repeated examinations no bacilli could be found in the ocular ulcer. Multiple abscesses formed secondary to the first. The

patient died in a month. Fuchs⁷⁴ observed a conjunctival tubercular abscess, that was probably indirectly caused by a grain of dust that had settled and broken the membrane. Pagenstecher⁷⁴ cured a case of tubercle of the iris by an iridectomy that removed the nodule. The case of Panas¹⁴² showed no tendency to invade the choroid or extend itself in the iris, and was not treated locally. Wagenmann's case¹⁸ of tubercle of the ciliary region led to enucleation. His report reviews the literature of the affection. A mistaken diagnosis of syphilis makes the case of Neese¹⁹ of interest. The examination after enucleation showed a tuberculous neoplasm of the ciliary body. Brailey and Hartley² report a case of tubercle of the choroid connected with traumatism and a foreign body that finally led to the excision of both eyes.

69. *Diabetes*.—Hirschberg,⁴ discussing the visual disturbances in diabetes, divides the subject, as follows, into two classes: 1. Those without recognizable structural modification. 2. Those showing changes, external or ophthalmoscopic. In the first class we have troubles of the accommodation, consisting either (1) of simple deficiency of accommodative power, or (2) actual paralysis with mydriasis. Hyperopia may complicate the latter, and, if so, convex glasses will, of course, improve the acuity and general condition. Instead of accommodative disturbance or connected with it, we may have varying degrees of amblyopia, in which case the prognosis as regards vision may not be so grave, but as regards life it is a bad sign, four out of seven cases dying within a year, and a fifth shortly after the appearance of the amblyopia. In these cases there is often a shadowy scotoma surrounding the object fixed. Of the lesions manifesting themselves in examination we may have suppurative keratitis, exudative iritis, cataract; opacities of the vitreous, due, probably, to retinal hemorrhages; retinal lesions, consisting either of hemorrhages or the characteristic brilliant spots grouped about the macula; optic neuritis with retraction of the visual field, or xanthopsia; diplopia, generally from paralysis of the external rectus, less often from the internal, possibly from others; and, lastly, chronic palpebral furuncles. A minor practical lesson derived from the paper is that we may suspect diabetes when the patient chooses stronger glasses and changes more frequently than is natural. Rolland¹⁶ has never seen a case of glycosuria without some disturbance of vision. In other forms of diabetes

the visual trouble is not so infallibly present. He says that 3 per cent. of those suffering with ocular disease are diabetic, and that the visual defect is the earliest symptom of all. Eight illustrative cases are cited in detail showing this. In all—amblyopia, paralysis, keratitis, cataract, papillary atrophy, hemiopia, etc.—the ocular symptoms preceded the constitutional. The visual disturbance is therefore not an immediate forerunner of death, but is, as it were, a signal of approaching danger. Every case of excess of sugar does not become diabetic, but all such have ocular disturbances.

Lagrange⁸⁵ reports fifty-two cases of diabetic visual troubles in 20,000 patients. Of these, thirteen were cataracts, thirteen hemorrhagic retino-choroiditis, four keratitis, etc. The ocular affections of another physician, Senut, are quoted: Of ninety-seven diabetics thirty-five had ocular troubles,—cataract one, diplopia four, and diverse lesions of the fundus oculi twenty-eight,—all amblyopic to a greater or less degree. Schirmer⁶⁸ reports a case remarkable for the effect of Carlsbad water upon the disease. There was iritis with pericorneal injection in a patient forty-two years of age; there was posterior synechia and pupillary exudate, intense and continuous pain. In three months acuity was reinstated, the adhesions could be broken with atropine, and there was diminished sugar in the urine. He reports another case, a myope of 2 D., whose only symptom was dizziness and a central scotoma for green. In two months coma and death followed. De Wecker¹⁴³ doubts if there is an exclusive diabetic retinitis. Cases usually classed as such either have concurrent albuminuria or atheromatous degeneration of the arteries, etc. There is never any papillitis in diabetic retinitis, so-called, nor consecutive optic atrophy. Kamocki¹⁹ and Deutschmann¹⁸ present the results of their anatomical studies of the eyes of diabetics. In all cases there was a noteworthy sponginess and an exuberant œdematous proliferation of the pigment-cells of the posterior surface of the iris. The meaning of this is doubtful. Deutschmann is opposed to the theory that the opacity of the lens is caused by a dearth of aqueous supply, and thinks it due to epithelial proliferation.

70. *Albuminuria*.—Gand⁸⁶ presents the histories of thirteen cases to illustrate his thesis that hemorrhagic retinitis may precede the existence of albumen in the urine, as pathognomonic of

Bright's disease. Often the albumen does not appear for a long time after there have existed these and other vascular lesions. Delalande⁸⁶ gives the histories of three cases wherein the retinal lesion pointed out the diagnosis before albumen could be detected in the urine. Trousseau¹⁴⁴ reports three cases in proof of the same contention. Fürst⁴ points out that retinitis is most frequently found in cases of contracted kidney, whilst in chronic parenchymatous nephritis with great albuminuria, visual disturbances, and retinitis, even in the most intense and fatal cases, are only seldom observed. The type of kidney-disease has, therefore, much to do with the prognosis. Except in some cases of nephritis gravidarum, he has never seen absolute blindness follow kidney-disease, and the person recover from all symptoms of the general disease. Nettleship²¹ proposes some ophthalmological conundrums in reference to a peculiar case of embolism or thrombosis of the central artery of one eye, followed twelve days later by a similar disturbance of the other eye. Chronic renal disease existed. The peculiarity of the case consisted in the retention of sight only in symmetrical sectors of the two fields, the upper out one-fourth or one-fifth. Why the arterial plugging should have been produced by the renal disease, and not the usual retinitis, and why the visual defect should have been so symmetrical, are interesting questions. The general opinion of the speakers of the British Ophthalmological Society,⁴¹ as to the rare cases of retinal detachment accompanying albuminuric retinitis, was that it was not simply due to dropsy alone. As to the prognosis in albuminuric retinitis there was some difference of opinion. Anderson and Gunn gave the patient a year, perhaps two. Others had seen cases of what seemed complete recovery. It would be well if Fürst's distinction were borne in mind by those studying such cases. It will be remembered that Bull's valuable statistics (1886) showed that out of 103 cases there was no permanent improvement of the vision, the perimacular stellate spots never disappearing. 57 died within a year, and 18 within the second year.

As regards cataract and the etiological rôle supposably played by albuminuria, it will be remembered that Deutschmann, who first put the question, found that in 266 cases of uncomplicated cataract 5 per cent. had albumen in the urine, and Landesberg found the percentage in 376 cases to be 11.7. Evetsky⁸⁵ has made

a study of 200 cases, and finds 38 with albuminuria, or 19 per cent.; but of this number in only 16 was the albumen persistently present. By a comparison of these statistics with those obtained from the examination of other non-cataractous nephritics and of relatively healthy old people, Evetsky's seemingly justified conclusions are as follow: 1. Age undoubtedly predisposes, so that in those 80 to 90 years old cataract is more frequent than not. 2. Ill-nutrition favors the development. 3. The two sexes are equally subject; in young nephritics cataract is rare; in old nephritics cataract is not more frequent than in old non-nephritics; albuminuria in those having cataract has in the greatest majority of cases only a physiological significance.

The most important contribution of the year upon the subject is without doubt that of our royal confrère, Dr. Carl (Herzog, Duke of Bayern).¹⁴⁵ It is a study of the pathological anatomy of about a dozen eyes with a history of albuminuric retinitis, and besides an exhaustiveness of detail without precedent, the examination possesses the advantage of having been extended beyond the retina to all parts of the eye, especially the uveal tract. The most important changes are found in the choroid and retina, and in a word show the existence of an arteritis to be the *fons et origo mali*. This degenerative process does not affect the endothelium, but the remaining coats are broken down by it. The process seems to start upon the outer side of the intima. The arteries and arterioles, but not the capillaries or veins, are the tissues bearing the brunt of the arteritis, which attacks all the vascular structures of the eye, but most destructively the choroid, next the retina, and then the ciliary body, iris, sclera, conjunctiva, etc. The peculiar injury to the choroid and retina is because of the fact that the vascular system of the choroid is a closed one without capillary anastomoses with other systems, and that the arteries of the retina, as Cohnheim says, are endarteries. Hence in blood-diseases, and especially in albuminuria, there is a peculiar likeness or sympathy existing between the affections of the two tunics. In the iris, sclera, etc., on account of the frequent anastomoses, there is always less damage. We append illustrative cuts reproduced from the original to show the exact nature of the arteritic process.

71. *Syphilis*.—The study of Mraček¹⁰⁷ is based upon the intimate examination of six cases of syphilitic periostitis of the orbit.



FIG. 1.—CHANGES IN THE RETINAL ARTERIES OF MIDDLE SIZE.

- 7—*a a a*, Large irregular masses in the outer layers.
b, Same in the middle layers.
c, Small-celled degeneration of the wall.
d, Homogeneous small-celled masses in the perivascular meshes.
 8—Diverticular formation (*a*) in a small retinal artery.
 10—Advanced degeneration of the vascular wall.

- 10—*a*, Small-celled leucocytes.
b, Thinning of the vessel-wall next the lumen.
c, d, Small-cell broken-down masses of the vessel-wall.
 Median drawing. (*a*)—Endothelial membrane.
b, Elevation of the vessel-wall.
c, Small-celled degeneration of the wall next the lumen.

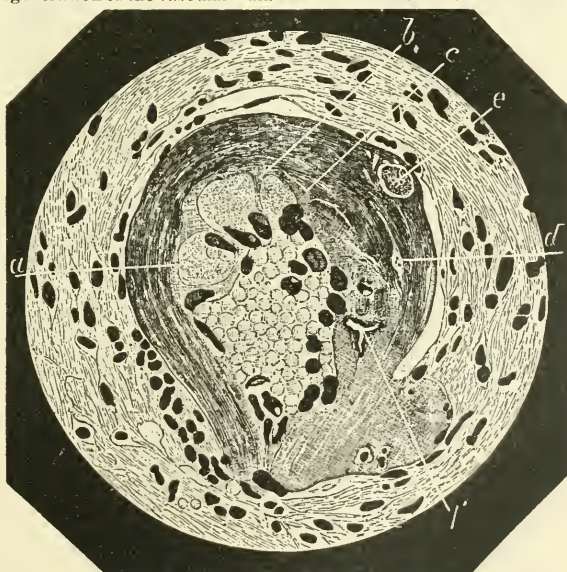


FIG. II.—DEGENERATIVE CHANGES IN A RETINAL ARTERY.

- a*, Space between intima and endothelial membrane filled with small-celled coagulum.
b, Connective tissue fibres between intima and endothelium.

- c, f*, Divisions in the inner layers.
d, e, Small-celled deposits in the middle and outer vessel-walls.

(From monograph of Dr. Carl.)



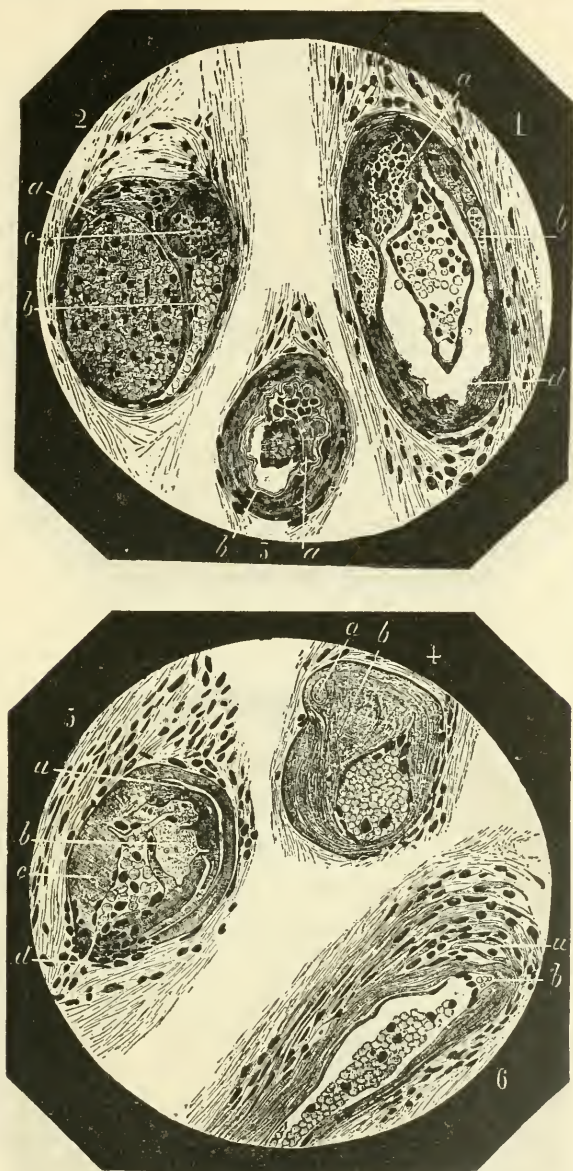
FIG. III.—EXTREME DEGENERATION OF THE SMALLER VESSELS OF THE PERIPAPILLARY ZONE.

- a*, Small arteriole, uniformly broken-down.
- b*, *d*, Nearly homogenous, obliterated vessel.
- c*, Incarcerated red blood-corpuscles.
- e*, The same changes in a smaller arteriole.
- f*, Small-cell infiltrate in the spaces, red blood-corpuscles between.



FIG. IV.—LARGE SPACES OF THE OUTER GRANULAR LAYER.

- a*, *b*, Increase of connective-tissue.
 - c*, Hydropic degenerate cells.
- (From monograph of Dr. Carl.)



FIGS. V VI.—VASCULAR CHANGES IN THE CHOROID.

- | | |
|--|---|
| 1.— <i>a</i> , Masses in the muscularis. | 4.—Extreme swelling of the vessel-wall. |
| <i>b</i> , Mesarteritic degeneration. | <i>a</i> , Large, small-cell mass. |
| <i>d</i> , Preservation of intima. | <i>b</i> , Fibrilla. |
| 2.—Aneurisma discans. | 5.—Distension and rupture of the wall. |
| <i>a</i> , Distension of the cell-wall. | <i>a</i> , Formation of inter spaces. |
| <i>b</i> , Blood between the inner and outer layers. | <i>b</i> , Small cell infiltrate. |
| <i>c</i> , Red and white blood-corpuscles. | <i>c</i> , Preserved endothelium. |
| 3.— <i>a</i> , Homogenous masses between intima | <i>d</i> , Point of rupture. |
| and media. | 6.— <i>a</i> , Cell infiltrate in the muscularis. |
| <i>b</i> , Intima. | <i>b</i> , Endothelium pressed aside. |

(From monograph of Dr. Carl.)



FIG. VII.—CHANGES IN THE CHOROIDAL VESSELS.

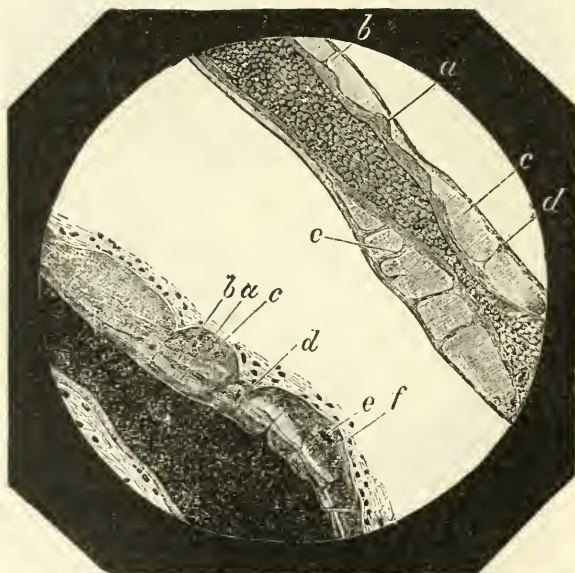
a, b, "Hyaline" effusion in the lumen.*c,* Wall of the vessel.*d,* Fibrillary increase of the adventitia-layers.

FIG. VIII.—CHANGES IN THE CHORIO-CAPILLARIS.

Above a, Increase of endothelial layer.*b,* Connective-tissue fibres between the endothelium and the perithelium.*c,* Same, extremely developed.*e,* Homogenous mass between.*d,* Sheath of perithelium.*Below a,* Endothelium.*b, d,* Strata of interposed mass, in part of endothelium.*c, f,* Small-celled products of degeneration in the outer layer.*e,* Broken-down red blood-corpuscles.

(From monograph of Dr. Carl.)



FIG. IX.—DIFFERENT DEGENERATIVE CHANGES OF THE LEUCOCYTUS AND RED CORPUSCLES.



FIG. X.—DEGENERATIVE CHANGES IN THE NERVE-FIBRE LAYER—*a, b, c, d, e, f*
(From monograph of Dr. Carl.)

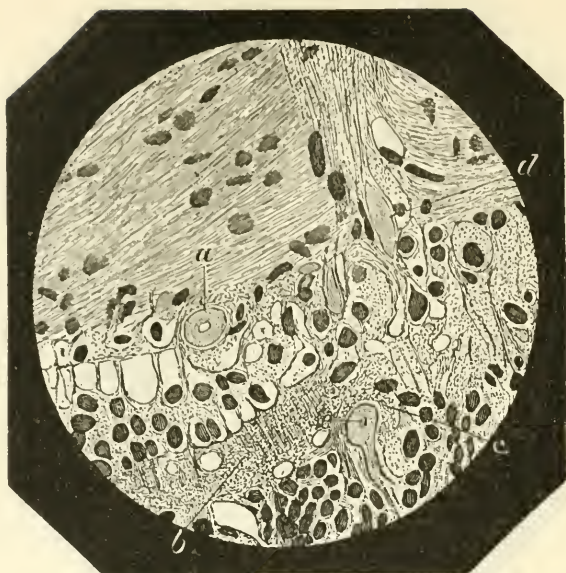


FIG. XI.—*a d, c*, Changes in the small arterioles and capillaries of the nerve-fibre and the ganglion-cell layer. *b, c*, Small-cell contents of the spaces.



FIG. XII.—DEGENERATIVE CHANGES IN THE GANGLION-CELL LAYER.

a, b, d, e, Hydropic swelling of the ganglion cells.

(From monograph of Dr. Carl.)

He divides these affections into those of the orbital margins (the most frequent form) and those of the orbital walls. The first, generally due to the tertiary form of the disease, occurs either in the form of a purely gummatous or destructive type, or in that of a productive or sclerosing periostitis. If treated in the early stages, before the formation of sinuses, it may be cured. The difficulty of diagnosis is of course greatly increased in those rarer manifestations of syphilis behind the capsule of Tenon, and which are doubtless often mistaken for less malignant forms of tumors on account of the great hardness of the growth. The upper wall is the more frequent seat, and persistent, increasing pain the chief symptom. Late in the history dislocation of the globe with strabismus and diplopia, possibly even optic neuritis, are frequent symptoms. The growth may break down, or it may eat its way through the wall into whatever cavities lie on the other side,—cranium, antrum, nose, etc.,—with correspondingly various results. Treatment of this type of the disease is almost entirely confined to general anti-syphilitic remedies. As to the affections of the orbital margins, operative measures may often be required, or may supplement the constitutional treatment. Browne⁴¹ thinks many cases of disseminated choroiditis in children, now considered as unexceptionally due to inherited syphilis, are really due to disturbances of nutrition during the growing period of the eyeball. Browne¹⁴⁰ again sets forth this distinction, and discusses an interesting observation as to the differential diagnosis of the veritable notched teeth of syphilitic inheritance, and what he calls the “tidal-mark tooth,”—a peculiar result of the fits of dentition, or teething convulsions, in which there is a projection of the dentine beyond the enamel. Sometimes the enamel does not cover more than a fourth of the tooth, or, again, covers it irregularly, more exactly simulating the Hutchinson tooth, and in either case frequently mistaken for it. Interesting relations are given of the connection between fits, zonular cataract, and tidal-mark teeth that cannot be reproduced here. Trousseau⁹⁶ reports two cases of hereditary syphilis without distinct syphilitic signs; the first had nearly suffered an enucleation under a mistaken diagnosis of tuberculosis of the eye, but the organ was happily saved by the recognition of the true nature of the disease. The second case was nearly blind from vitreous opacity, but was completely cured by the specific. Tepliachmé, of Russia,⁴⁶ commu-

nicates a loathsome fact,—that there was a veritable epidemic of syphilis in one district by the superstition that every ocular trouble was caused by the presence of a foreign body, and that licking or sucking the eye by certain women was the best method of removal. One of these women, with mucous patches of the mouth, is said to have inoculated more than a tenth of the inhabitants of the district with syphilis, the initial lesion being usually a chancre of the upper lid. The rôle played by syphilis in the production of interstitial keratitis has already been referred to in §27. Abadie³¹ treats interstitial keratitis by subcutaneous injections of bichloride of mercury. A few drops of cocaine may precede the mercury, and the needle must be plunged well beneath the skin. Improvement is noted after about a dozen daily injections. The same method is also used in certain cases of disseminated choroiditis, and in those cases of paralysis of single ocular muscles (usually the sixth) that do not yield to the usual treatment. Martineau¹⁶ has treated over 6000 cases by this method, finding the remedy thus given unexceptionally satisfactory in the rapidity and thoroughness of the cures. Besnier¹⁶ criticizes the method, as producing local abscesses and other troubles. Ruckert's case⁶⁸ of iritis and conjunctivitis, with concurrent gonorrhœal rheumatism, illustrates Haltenhoff's belief that conjunctivitis without inoculation may arise in the course of gonorrhœal rheumatism. Hogg⁵² was successful in dispelling a severe case of specific iritis with corneal implication that had long resisted all other remedies, by continued use of turpentine, 5ss., *t. d.* Haab¹⁴⁶ had a case of arteritis, of syphilitic origin, of a single branch of one of the retinal arteries. The trunk showed spots of brilliant whiteness, often of a scaly appearance. Gradle³⁴ had a case of double amaurosis of central origin, with iritis, of syphilitic origin. Under specific treatment the vision was saved, but the brain-disease finally terminated fatally. Another peculiar case was one of gummatous iritis with recovery under treatment; but there followed, immediately after two months of specific treatment, a neuro-retinitis of the other eye, presumably of intra-cranial origin. This finally ended in recovery. From an examination of 148 syphilitics, Tornanitzki²⁷ found impaired visual acuity in eighty-four (60 per cent.) present, during the condylomatous stage of the disease. No direct relation between the amblyopia and the intensity of the syphilitic symptoms was found to

obtain. The amblyopia yielded to specific treatment sooner or later. There was a direct relation between the degree and the duration of the amblyopia. The amblyopia depended upon the syphilis, remitting or disappearing with the other symptoms, and it is held by the reporter to find its analogue in the diminished sensibility of the skin, and to pain generally, in syphilitics. Oppenheim⁴ thinks he has found a valuable diagnostic sign of *lues cerebri* confined to a new growth pressing upon the chiasm in hemianopsia bitemporalis fugax, and in such cases counsels a frequent use of the perimeter, especially with colors.

72. *Toxic Amblyopias*.—The important paper of the year in this field of study is that of Uthoff¹⁸ on *alcohol and tobacco amblyopia*. The clinical facts are gathered from 1000 cases of chronic alcoholism, and the pathological anatomy from 7 cases. Among the 1000 there were 139 with decided discoloration or pallor of the temporal portion of the papilla, and out of this number there were 60 instances of visual impairment. We thus see that the visual deterioration and ophthalmoscopic change do not stand in an exact relation to one another. The toxic influence seems never to proceed to absolute blindness, and in only two cases was the amblyopia so great as $\frac{6}{200}$. Color sense is more uniformly affected than the reaction to white light. Central scotomata for green and red is generally the rule, and often there is no response to these color stimuli at the peripheral portions. The blue scotoma, when it exists, is not so extensive as that for red and green. There were a few instances of absolute central scotoma,—no light or color reactions, and the zone of blue was smallest, next red, and then green. The periphery is always responsive to white light. In 8 cases the atrophied part of the papilla was only one-fourth, or less, of its entire surface. In 12 cases the temporal discoloration of the papilla was monocular; in 15 cases it was but very slightly affected. In 4 cases the nasal side was also pallid, though less so than the other side, and in 2 of these cases there was no defect of vision. In the 1000 there were 9 instances of amblyopia without ophthalmoscopic change, proving again that generally the papilla shows the influence of the toxic agent before the subjective sensation. There were 7 cases of retinal hemorrhage, and 60 of some abnormality of the pupil, 22 of paralysis or anomaly of the ocular muscles, 15 cataracts, etc. Of 30,000

cases of eye-disease, Uthoff has found 204 of retro-bulbar optic neuritis, of which 64 are classed as due to alcohol and 23 to tobacco, whilst 45 were caused by one or the other agent, or by a combination of both. No distinctions, either by the ophthalmoscopic examination by the perimetrical or by the post-mortem study of affected eyes, can be drawn to enable one to decide between alcohol or tobacco. Poetschke's attempt to show that in tobacco amblyopia the scotoma is paracentral, and in the alcoholic type pericentral, is not substantiated. As to the pathology, it is distinctly and uniformly a retro-bulbar neuritis with secondary atrophy of the nerve-fibres. The interstitial neuritis and degeneration is most extensive in the retro-bulbar portion of the optic nerve, but extends also back into the cranial part, and forward to the perimacular zones of the retina. There is increase of connective tissue, though some healthy nerve-fibres are always found in the most advanced cases; whence the fact that some response is always present to light, and, even with severe ophthalmoscopic changes, vision is sometimes but slightly interfered with. The parts of the nerve affected correspond to the indications of the ophthalmoscope. The essays are of great interest, and contain a large number of facts and deductions that we regret our inability to summarize. Chisolm² reports a case of clear tobacco amblyopia (no ophthalmoscopic lesion he says) in a refined lady, who had learned to smoke "to keep her husband company." Bendell¹⁴⁷ has had seven cases of uncomplicated tobacco amblyopia, and in one case persistent use of the strong "navy plug" finally led to "nearly total blindness." Schweinitz⁵¹ reports a unique case, tobacco amblyopia in a young woman from working in a tobacco factory. Change of employment and strychnia soon restored her. (Have any of our Southern brethren ever found a case of amblyopia among the "rubbers" or "dippers"?) Powers²⁵ finds the inhalation of amyl-nitrite useful in differential diagnosis. In tobacco or alcohol amblyopia there is immediate temporary improvement; in atrophy from other causes there is none. Nettleship² leans to the belief that tobacco is more frequently and generally the source of the mischief. He has only seen two cases of central amblyopia of the type considered in which tobacco was not the cause. Browne² has also seen no case of amblyopia due to alcohol alone. Of his 49 patients, 17 were heavy drinkers, 4 teetotalers. Griffith²

finds a tendency to recover, even without complete disuse of tobacco. He has seen 5 cases not dependent on tobacco, 14 cases in women, and 2 cases in men under 23. Frost² has met with no case without tobacco; he recommends iodide of potassium instead of strychnine. All of Jessop's cases, and those of Morton also,² were tobacco users. Sachs,¹⁹ in an exhaustive examination of one case, and from a review of the literature, finds that Samelsohn's theory does not hold. Sachs finds that the optic nerve-fibres leading direct to the macula, and holding an axial position in the canalis opticus, are not the ones predisposed to disease in retinobulbar neuritis and central scotoma, but, instead, it is in the bundles lying excentrically outwards and downwards that the degenerative processes begin and continue. The importance of reëxamination of railway employés, pilots, etc., has been mentioned. *Quinine amblyopia* has had several illustrative cases during the year. Browne⁵³ had a case of temporary blindness following the ingestion of 120 grains of quinine in one day. Vision began returning in six weeks, but the patient only recovered normal vision in about six months. A similar case is reported by Roosa.² In Peschel's case²⁷ temporary blindness was followed by some light perception, narrowed field, and failure of color response. The field was a perpendicular oval about the macula. In nine months extremely narrowed vessels existed, partial atrophy of the papilla, limitation of the field more for white and green than for blue, and normal central acuity. The smallness of the doses—three to four grains—leads to a belief in a mistaken diagnosis so far as relates to the cause. Mellinger's case⁶⁸ never regained better than $\frac{2}{7}$ vision. Pupillary reaction returned nearly to the normal; papilla very pale, vessels threadlike, color-blindness, and narrowed fields, are the points noticed. In one of Mr. Nettleship's two cases⁴¹ the patient had an idiosyncrasy to the drug, small doses having twice caused gastric and visual troubles. Ulrich,¹⁸ in general, confirms Brunner's results as to experiments with quinine upon dogs, finding a decided ischæmia of the retinal vessels the striking feature. Ulrich shows that in dogs *chloral* produces a decrease of ocular tension. Cheatham¹⁴⁸ had two cases of eye trouble that he ascribes to chloral. Severe photophobia was a feature. He has seen several people in whom hyperæmia of the conjunctiva and photophobia would follow one dose of fifteen

grains. Lavigerie¹¹² had two cases of visual trouble from *carbon bisulphide*. Vision in one case was reduced to $\frac{1}{10}$, or to finger counting, but the field was normal in extent except slightly retracted to green and red. There was pallor of the papilla, but normal vessels. A relapse occurred (after the recovery sufficient to go about his work in a few months), but was again cured by the same treatment as before,—strychnia and iodide of potassium. The other case, a workman in the same materials, happened later; was a less severe attack, but in all essential respects there were the same characteristics. Little² had two cases of poisoning from the same substance, presenting very similar symptoms, but in both of these cases there was more or less contraction of the fields. Recovery was slow in both cases, but was finally attained. Solomon⁴¹ reports a case of nausea and vomiting following a single instillation of *eserine* solution gr. iv. to 3j. The writer has had a case (unreported) in which successive attacks of retching were set up in repeated trials of solutions of one-half, one-fourth, and one-eighth the above strength. An extremely weak solution was at last borne.

Hallucinations of vision for twenty-four hours followed an enema of seventy-five grains of *salicylate of sodium* in a patient of Schiffer.¹¹⁹ Schweinitz⁵⁴ had four cases of hyperæsthesia of the retina associated with *oxaluria*, and which other treatment failed to relieve until the oxaluria had been conquered. Dutertre¹⁶ finds the troubles of vision often resulting from eating *mussels* is because of a disease of the liver of this shell-fish, which produces an alkaloid, mytilotoxine, similar to curare in its action. Ten persons are reported¹⁶ to have been severely poisoned, two fatally, by eating *smoked sausages*. The visual troubles were pupillary dilatation, paralysis of the accommodation, and ptosis. The accommodation paralysis persisted for a long time. A case of amblyopia in a tea-taster, and supposably due to prolonged *tea-tasting*, is reported from Russia.⁷ Workmen handling *vanilla* are by Morron¹⁶ said to be often attacked with blepharitis.

NERVOUS DISEASES.

73. *Herpes Zoster*.—Mittendorf notices the increase of herpes zoster frontalis due to what he considers an important element in the etiology of the affection, the growing wear and tear, care and

anxiety of life. He presented to his clinical class several interesting cases. His treatment is arsenic in full doses (one-twelfth, *t. d.*), either in conjunction with rhubarb and soda or with quinine, and also the Faradic current. If the cornea is implicated he uses atropine, having found eserine to increase the pain. When the healing of the pustules begins he uses an ointment of the red oxide of mercury with morphine, gr. x. and gr. iii. respectively, to ζ ss. Wheelock¹⁵⁰ had a patient suffering from a very severe attack, with extensive complications of plastic iritis, posterior synechia, occlusion of the pupil, hypopyon, corneal ulcer, etc. To the Faradic current is credited decided benefit in promptly relieving the anæsthesia of the cornea and an extreme sensation of coldness of the globe, as well as causing the disappearance of the corneal ulcer. Strychnia was also used. Herz⁶⁸ finds ciliary herpes to have a close correspondence with lymphatic conjunctivitis, and that it is frequently accompanied with a facial eczema. In the cases of the author there was almost always phthiasis, and the explanation given of the connection with herpes is that the latter is a reflex irritation. Sometimes the herpes arises without the facial eczema. Durruty¹⁶ thus summarizes the results of his studies of ocular herpes: 1. Whether its cause be a constitutional diathesis, traumatism, etc., herpes consists of a vesicular eruption of the skin or mucous membrane, whose immediate cause is a paralysis of the trophic and sensitive nerves supplying the part. 2. Ocular herpes is the result of a more or less complete anæsthesia of the trophic filaments of the trigeminus. 3. The inflammatory type, including keratitis, is the most frequent form. 4. Corneal ulceration is a secondary result of inflammatory corneal herpes, complicated by microbial infection. Quinine, rigorous antisepsis, and cauterization of the cornea, either with nitrate of silver solution or with the thermo-cautery, are the therapeutic agents employed.

Picot¹⁵¹ had a case of facial paralysis and Bell's palsy complicated by ectropion of the lower lid, leading to the usual sequelæ. In another case there were trophic lesions, total insensibility of the globe, diminished tension, corneal nebulae, blindness, etc., not due to the facial paralysis, but due to scrofulous caries of the petrous portion of the bone transmitting the nerve-trunks.

74. *Relations of the Eyes and the Nose.*—Ziem²⁷ has almost entirely dispensed with the galvano-cautery of the nasal mucous

membrane because of a conviction that it induces an altered circulation within the eyeball that, at times, leads to papillary hyperæmia, visual disturbance, etc. Three or four cases are cited in illustration. Great impairment of vision resulted in one case, how permanent is unfortunately not stated; slight contraction of visual field, hyperæmia of the papilla, increased tension, venous pulsation, etc., are the symptoms traced directly to the cauterization. Ziem²⁷ in a second communication gives the details of three cases of iritis accompanying nasal disorders of a purulent character, and that he believes to have caused the ocular trouble. Bobone³¹ reports a case of exophthalmic goitre cured, as he avers, not only of the exophthalmos, but also of the general symptoms, by a cauterization of the hypertrophied mucous membrane of the inferior turbinated bone and nasal passages. In another instance cauterization in a case of hypertrophic rhinitis led to great amelioration of the exophthalmic symptoms. Berger¹⁹ also reports a case where cauterization of the nasal mucous membrane led to pronounced amblyopia, everything to the patient appearing as through a thick fog. Recovery was slow, but complete. Bettmann³⁴ believes in the close connection of ocular and nasal diseases. A swelling of the anterior turbinated bones in a boy led to profuse and constant epiphora; this last disappeared with operative treatment of the nasal trouble. Proof of the causal relation was made clear by the exceptionally profuse lachrymation following upon touching the nasal tumour with a probe. In another case, polypus of the nose caused epiphora, likewise cured by removal of the polyp. In yet another, photophobia with epiphora was temporarily relieved by cocaine pledgets in the nostrils. In two of these cases light thrown on the retina would produce sneezing. (The reviewer has known people who sneezed whenever passing from the house into sunlight.) Gradle³⁴ has been able to cure cases of pseudo-Spring catarrh by cauterization of the nose. He has had cases of epiphora with no stricture of the duct cured by simple treatment of the nose; and also a case of asthenopia not curable by other means without also curing the nasal difficulty that complicated the case. Reference is also made to nasal polypi playing the same rôle, and to common adenoid vegetations of the posterior nares; to several cases where extirpation of the large post-nasal tonsil as giving relief to the eye; to a few cases where ulcers or chronic keratitis were kept

up by nasal trouble; to chronic catarrh leading to congestive obstruction of the tear-passages; to exophthalmos from increase of vascular tissues in the orbit, etc. Gradle again returns to the theme,⁴³ more accurately describing the ocular symptoms due to nasal disease. Lachrymation without any primary trouble of the lachrymal apparatus itself is found to be not rarely due to nasal affections, such particularly as nasal catarrh. There is also a feeling of fullness of the lids, with itching, and sometimes pain in the eyes, of nasal origin. This is often severe enough to render near-work impossible, and the trouble tends to attack one eye more than ocular asthenopia. Hack's contention is confirmed, that vascular engorgement (of the nasal mucous membrane) is responsible for the production of nasal reflex neuroses. The hay-fever type of conjunctival inflammation is discussed. He has now had five cases, in which all therapeutic measures failed. Itching and discomfort of the lids is the prevailing symptom. The connection of the disease with nasal irritation is more than probable. The nasal origin of some cases of photophobia, burning and smarting of the eyes, he has proved by the success of the nasal treatment. Injection of the pericorneal vessels has in three instances been traced to inflammation of the nasal passages, by immediate relief of ocular symptoms after cure of the nasal difficulty. Schmidt-Rimpler⁶⁸ had a case of complete binocular blindness following a nasal operation for the removal of a polyp. In the right eye there was a slight discoloration near the papilla, arteries and veins were well filled, the veins of both eyes tortuous, the papilla of the left eye slightly swollen. There was stabile mydriasis. No improvement.

75. *The Eye and Ear*.—Pooley³² had a case of typical Menière's disease where there was also optic neuritis and the typical retinal picture of Bright's disease; repeated examination of the urine, however, showed no albumen. There was no syphilitic history; and the autopsy showed no cerebral tumor or extravasation. There was slight congestion and enlargement of the kidneys. Kipp¹⁵² advises the early examination of the eye-ground in cases of aural troubles, so that preëxisting optic neuritis may not be confounded with that arising from the aural affection. He does not find that optic neuritis is a constant symptom of aural meningitis or cerebral abscess, nor that the intracranial affection accompany-

ing optic neuritis is always fatal. In suppuration of the middle ear with retention of the pus, trephining of the mastoid process is the proper treatment. Mackinlay¹¹ had a case of paralysis of both external recti, accompanied by partial deafness of both sides. Wadsworth³⁴ had a case of ptosis, mydriasis, nearly complete ophthalmoplegia externa and headache recurring at intervals, and which he traces to aural disease, through the intermediation of a meningitis. There is a review of the literature, comprising about fifteen similar cases, that is of interest.

76. *Relations of the Eyes and the Teeth.*—In Professor Brubaker's admirable summary¹⁵³ of the Reflex Neuroses associated with Dental Pathology may be found *résumés* of most of the cases (about 115) reported up to the time of publication, illustrating the pathological relations of the eye and teeth. The numerous instances serve to show that these mutual relations are somewhat more intimate than is commonly supposed. We note cases of strabismus, ptosis, diplopia, paresis, paralysis and spasms of the external and internal ocular muscles, neuralgia, lachrymation, sclerotitis, conjunctivitis, keratitis, mydriasis, paralysis of accommodation, glaucoma, amaurosis, amblyopia, and exophthalmos,—all caused by diseases of the teeth, and most of which were relieved at once upon removal of the cause. To these a few may be added. Rumeau⁸⁶ reports three cases: 1. Œdematous conjunctivitis and blepharitis, with stabile mydriasis and exophthalmos. The extraction of a tooth drained an abscess of the maxillary sinus, and recovery from the ocular symptoms was prompt. 2. Keratoconjunctivitis, with œdema of the lids consequent upon swelling of the face from a carious tooth; disappearance of ocular troubles upon incision of abscess. 3. Conjunctivitis, blepharitis, and lachrymation from swollen gum and carious tooth. Rumeau concludes that not all ocular troubles of dental origin are examples of reflex neuroses, but that many of the more superficial depend upon some obstacle to the venous circulation, by compression of the ophthalmic or facial vein. Tyner¹³⁰ says that Redard reports a case [where? when?] wherein glaucoma was not relieved by successive sclerotomies, but that the removal of a painful tooth upon the same side diminished the tension. Brunschvig¹⁶ gives the details of two cases of hypopion (with subnormal tension, iritis, etc.), in which there was an immediate disappearance of the pus upon the extraction

of carious teeth. Browne¹⁴⁰ has found that when there is a history of fits with zonular cataract there will be found malformed teeth. Seven cases are referred to where five had fits and now showed malformed teeth, while two gave no such history and the teeth were uninjured. The distinction between the "tidal-mark" tooth and that of hereditary syphilis has been referred to. From difficult eruption of teeth as a primary cause, therefore, result convulsions or fits, impairment of the temporary enamel organ, and injury to the lens, followed by slight opacities or absolute cataract. A case reported by Ziem²⁷ began in the suppurating root of a tooth, extending to the nose, and thence produced in some way iritis, synechia, and amblyopia.

77. *Gastric Origin of Ocular Affections.*—Turnbull⁵⁴ lays emphasis upon the frequency of origin of the phlyctenular ophthalmia of children in gastric disturbances caused by insufficient or, more frequently, improper food and feeding, is almost prone to characterize the disease as "reflex gastric ophthalmia." Grand Clément⁸⁵ also speaks pointedly of the dyspeptic origin of a number of affections of the eye, especially those of an intermittent character, and traces their origin to the elaboration of toxic alkaloids, ptomanies, from the maldigested articles of food; and, from their absorption into the system, arise the numberless forms of neurasthenia, general or special. A Spanish journal²⁷ gives several illustrations of ocular troubles from intestinal worms, among them a case of strabismus, one of congestion of the conjunctiva, and one of amaurosis, all disappearing at once upon the administration of a vermifuge.

78. *Relations of the Eye and Sexual Organs.*—The valuable lectures of Mr. Powers⁷ are the most important contribution of the year upon this subject. Besides gathering to a focus the reports of others, he adds many cases of great interest drawn from his own practice. Only a slight experience is needed in such cases to make one assent with hearty commendation to the caution that is urged as to a hasty diagnosis. There is the greatest liability to error from the multiplicity of possible causes. In reflex neuroses it is almost always difficult, often impossible, to tell from what part of the organism proceeds the hidden mischief. On the whole he is inclined to think the effects of masturbation exaggerated. A typical case of agoraphobia is traced to that cause, and a case of retinal

hemorrhage is given with a like history (we omit the reports of old cases gathered from the literature). Pallor of the disk with great impairment of vision was caused in another case by six weeks of venereal excess, vision returning with sexual sanity; white atrophy and blindness in old men marrying young women; retinal and choroidal hemorrhages at the period of puberty in girls; pannous keratitis from suppressed menstruation; blindness from ovaritis; conjunctivitis from slight exposure to cold during pregnancy (susceptibility to cold from ill nutrition, etc.); hemorrhage from retching; albuminuric retinitis; mydriasis in pregnancy, and sudden loss of vision; detachment of the retina from suckling children, etc.—these are some new illustrative examples of old pathological laws. Of novel and unusual interest are the deductions drawn from a table of the cases of keratitis in St. Bartholomew's Hospital.

NUMBER OF CASES OF ALL KINDS OF KERATITIS IN MALES AND FEMALES
AT DIFFERENT AGES.

Age.	Male.	Female.	Proportional decimal.	
			Male.	Female.
— to 10	42	77	0.304	0.37
11 to 20*	37	73	0.265	0.356
21 to 40	39	39	0.28	0.19
41 to 50†	9	5	0.067	0.024
50 to —	11	11	0.08	0.053
Total	138	205		

* Menstruation commencing.

† Climacteric.

The table shows that: 1. There are many more cases (205 females to 138 males) of keratitis occurring in females than males. 2. That the difference is most marked in the decade previous to and contemporaneous with the decade of commencing menstruation (150 females to 79 males). 3. That in the first decade 30 per cent. males to 37 per cent. females of the whole number occur. 4. That in the decade of commencing menstruation there is a distinct difference in the percentage of males and females. Thus, in

males it is only 26 per cent., while in females it is 35 per cent., an increase of nearly 10 per cent., due to, or certainly contemporaneous with, the period of commencing menstruation. 5. That during the menstrual period of life (twenty to forty) there is a diminution among females compared with the same time of life in males. Thus, in females 19 per cent. occur between the ages of twenty to forty years, as against 28 per cent. for the same period in males. 6. That at the age of the climacteric (from forty-one to fifty) there is a sudden fall in the percentage, the males being higher (6.7 per cent.), the females being 2.4 per cent. After fifty there is a rise in the number of cases in both sexes, males being still greater. Thus: males, 8 per cent.; females, 5.3 per cent. 7. That it is curious to note the fact that, in spite of the greater exposure, etc., in males, the female cases have a greater sum total, suggesting that women are more liable to keratitis than men. 8. In some cases occurring between twenty to forty years in women, over-lactation or bad confinements have been given as the constitutional causes.

It is also found that interstitial keratitis is more frequent in women than in men (28 to 13), and that the average age for men to be attacked is $17\frac{9}{5}$ years, for women $15\frac{3}{8}$. The lecturer thinks menstrual disorders play a part in the development of conical cornea. The prognosis in albuminuric retinitis is impossible to be stated, blindness or recovery, or peculiar complications taking place without discoverable law. The lesson the obstetric physician may learn from the ophthalmoscope is that the existence of hemorrhages and of white patches upon the retina indicates that the normal relations between the blood, the vessels, and the tissues are so modified that healthy nutrition can no longer be maintained, and that unless speedy relief be afforded similar changes will occur in the brain, with convulsions, and perhaps death, as a result. The following, then, in brief, is the *résumé*: That in males the excessive excitement of the sexual organs in youth occasions various subjective symptoms on the side of the eyes, as *muscæ*, *photopsiæ*, *asthenopia*, and loss of accommodation, together with *blepharospasm*, and, at a later period, possibly *retinitis*, *retinal hemorrhages*, and *white atrophy*. That in young women the epoch of the installation of menstruation may be attended with *conjunctivitis*, both *phlyctenular* and *follicular*, and *ulcers of the cornea*, with

special disposition to the development of keratitis consequent on constitutional taint. That amenorrhœa, especially if suddenly induced, may be followed by hemorrhage into the anterior chamber or into the vitreous, iritis, irido-choroiditis, optic neuritis, and white atrophy of the optic disk. That dysmenorrhœa may be accompanied by conjunctivitis, keratitis, episcleritis, as well as by inflammation of the uveal tract. That the menopause is often accompanied by effusions into the vitreous and by a disposition to glaucoma; by paresis or paralysis of the ocular muscles. That pregnancy is often attended in the early months with asthenopia, and towards the close with albuminuric retinitis and its consequences,—hemorrhages and white patches on the retina,—and that, if delivery is attended with copious hemorrhage, loss or great impairment of vision, with white disks, may occur. That in the puerperal state we may meet with embolism, which is sometimes of a septic character, and may rapidly lead to loss of the eye. And, finally, that in lactation—if we may be allowed to include that process in the consideration of the sexual organs—we find asthenopia, great tendency to suppuration of the cornea on slight scratches, and lachrymal diseases to be of common occurrence.

Morse³² gives the details of five cases of what he calls “menstrual asthenopia,” in which the prominent symptom is great exacerbation of the ocular trouble during the menstrual epoch. Ametropia may coexist, but its correction must be conjoined with correction of the menstrual difficulty if great results are obtained. In two cases relief from the distressing ocular symptoms (supra-orbital pain, photophobia, headache, etc.) was only obtainable (by gynecological treatment) during the time between the periods, the on-coming flow again bringing with it the ocular troubles. In other cases no disorders of the sexual organs or functions could be found, and therefore no relief. Many other similar cases are referred to as unworthy of reporting because so like these. The influence of menstruation on the functional activity of the eye has been studied by Finkelstein.¹⁵⁵ The subjects were twenty healthy women from nineteen to thirty-three years of age. The results obtained are as follows:—

1. During the menstrual period there takes place a concentric narrowing of the field of vision. 2. The phenomenon makes its appearance one, two, or three days before the beginning of the

hemorrhage, reaches its greatest intensity on the third or fourth day of menstruation, and then gradually disappears about the seventh or eighth day of the period. 3. The narrowing varies in degree in individual cases. In general, it is more pronounced in those women whose menstruation is associated with malaise, headache, cardiac palpitation, and other nervous symptoms, as well as in those who lose larger quantities of blood. 4. Not only the field of vision for white, but also the visual fields for green, red, yellow, and blue, undergo a regular diminution. 5. Perversion of perception of green (which is then seen yellow) is observed fairly often (in 20 per cent.), the phenomenon disappearing simultaneously with the contraction of the fields. 6. The central vision becomes impaired but slightly, to rapidly return to the standard after catamenia. 7. Refraction remains intact.

Caudron⁴⁶ notes a case of swelling of the lachrymal glands, occurring during the menstrual period. Senator¹³³ had a patient afflicted with periodical ptosis, vomiting, headache, etc., connected with menstrual abnormalities. Gayet's⁸⁵ case of panophthalmitis was secondarily started by suppression of the menses. Magnus⁶⁸ had a case of amaurosis without cause, existing during four months, in a girl at the age of thirteen. De la Peña³⁸ reports a case of tears of blood, lasting some days, in a girl of fourteen. Mannhardt⁶⁸ believes that monocular mydriasis without other demonstrable cause is dependent on fibroid tumor of the uterus. Rampoldi⁶⁹ noticed periodical paralysis of the oculomotorious in a girl with menstrual troubles. There was also some ptosis and squint. Lange's¹⁸ case of primary glaucoma, in a woman of twenty-two years of age, was connected with an amenorrhœa of seven months' standing. There were severe and frequent attacks, relieved finally by a sclerotomy. Morse³² noticed asthenopia in five cases of uterine disease. Fürst¹ had a case of retinitis albuminurica from pregnancy that ended in absolute blindness. The woman lived but nine months, dying in the next pregnancy. Wadsworth² reports a case of extensive retinal detachment from the same cause, in which, under treatment and after premature labor, the detachment has been cured, and there is improvement in vision. Marcuse¹³³ had a case of complete blindness, lasting one day, and returning slowly thereafter to normal, from uræmia, in a patient suffering with albuminuria

during pregnancy. Koubli¹² had two cases of erythroptosis during pregnancy. In a woman with puerperal fever, Wagenmann¹⁸ found that an embolus containing cocci had lodged in the arteria centralis, and, dividing, had plugged the arterioles and capillaries, rapidly filling the retinal vessels, and then most of the remaining ocular structures, producing suppuration wherever they gathered. Collins²¹ has had ten cases of accommodative paralysis or paresis during lactations within twelve months. The particulars of a typical case are given. In a fit of melancholy, brought on by long nursing, a patient of Crouigneau⁹⁶ tore apart the inferior rectus of one eye, and wrenched out the entire globe of the other eye. Mackinlay¹¹ also had a case where, following rapidly succeeding pregnancies and during lactation, a woman, in a fit of depression, tore out one eyeball with a meat-hook. There was rapid recovery, and a subsequent pregnancy brought to termination without accident. Polaillon⁹⁶ found it necessary to enucleate the globe of a woman in the seventh month of pregnancy. The operation was done under chloroform, with no accident to the pregnancy. Allusion has been made to the injury to the eyes of children by the obstetrical forceps. Five such cases are now on record.

79. *Semeiology of the Pupil*.—The results of Macewen's study⁹¹ cannot be summarized better than in his own words:—

(A) 1. When the function of the brain is in abeyance, the pupils are in a state of stabile mydriasis.

2. This may arise either from temporary suspension or from abolition of function.

3. Temporary suspension is illustrated by shock, and the effect of some poisons; while the abolition of function is exemplified by extensive laceration and compression of the brain.

(B) 4. When the function of the brain is interfered with by conditions usually included under the term "irritation," the pupils are in a state of myosis; sometimes labile, but generally stabile, myosis.

5. This "irritation" or interruption of function may be seen during certain degrees of cerebral anæmia, produced experimentally, and not as a pathological result; certain amounts of brain-pressure, and certain stages of intra-cranial inflammation.

6. These are illustrated in persons who have suddenly lost a considerable quantity of blood (about a fifth of the whole); in the

growth of intracranial tumors and the formation of sanguinolent serous and purulent effusions, when the degree of pressure may be denominated as "medium," and at certain periods of meningitis and encephalitis.

(C) 7. The same pathological factors which cause myosis may also cause mydriasis, the degree in which these factors are present being the determining point between the former and the latter, and not *merely* the particular locus in the brain.

8. It is well illustrated by cases where the hemorrhage is repeated, and is finally pushed to syncope; in intracranial pressure, which is gradually increased until it becomes great, such as arises from tumors, blood-clots, and inflammatory products.

(D) 9. When the function of one-half of the cerebrum is placed in abeyance by a superficial or cortical lesion, the pupil on the same side as the lesion is in a state of stabile mydriasis.

10. This is well illustrated in cases of intracranial sanguinolent effusion consequent on injury.

(E) 11. When the function of one-half of the cerebrum is interfered with by some source of cortical irritation, the pupil on the corresponding side to the lesion is in a state of myosis.

12. This is illustrated by traumatic and pathological lesions affecting the cortex of the cerebrum.

(F) 13. Hemorrhage into the pons Varolii when small causes strongly contracted pupils; but when it is more extensive, involving the gray matter beneath the aqueduct of Sylvius, a state of stabile mydriasis is induced.

14. Effusions into the lateral ventricles when small produce contraction of the pupils, but when the effusion is great stabile mydriasis ensues.

15. Inequality of the pupils indicates a unilateral lesion or lesions.

16. When the lesion is cortical and unilateral the pupillary manifestations are on the corresponding side. When the basal nerves are affected unilaterally the pupillary effect is manifested on the same side as the lesion. When the lesion is unilateral and affects the function of the white fibres of the cerebrum the opposite pupil is generally affected. When the basal ganglia are implicated unilaterally the pupil is sometimes affected on the same side as the lesion, occasionally on the other side.

In a case of cholesteatoma and in another of glioma of the right optic thalamus, dilatation of the left pupil was found (*Ross*, vol. ii. p. 572).

In lesions of the cerebral peduncles the pupil is affected on the same side as the lesion.

Lesions in the corpora quadrigemina affect both pupils, irritation causing contraction, destruction causing dilatation and immobility.

Section or destruction of one optic tract causes dilatation of the opposite pupil and blindness of the opposite eye.

17. Irritation of the cord, especially the cilio-spinal axis, produces dilatation of the pupils, while destruction of the cord causes contraction. These effects are generally seen in both pupils, though, experimentally at least, they may be confined to the same side as the lesion.

18. The pupils are affected in the same way by lesions of the sympathetic, though in unilateral lesions it is only the pupil on the same side as the lesion which is affected.

19. Speaking generally, when myosis is due to a cerebral cause, it indicates the earlier stages of various affections; when due to a spinal lesion it points to a most serious paralysis, often to the destruction of the part. When mydriasis arises from a cerebral lesion it is generally present in large amount; when due to a spinal affection it indicates irritation of the part.

Spitzka¹⁵⁶ emphasizes the importance of careful pupillary examination in cases involving nervous symptoms. In a rough way he concludes that paralysis of light reaction means organic disease of the cord, brain, or syphilis; while paralysis of accommodation means toxic (diphtheritic) paralysis; and inequality of the pupils, unilateral or focal brain-disease. Of 1000 persons showing reflex iridoplegia, 950 will, before five years have elapsed, develop either tabes dorsalis, parietic dementia, cerebral syphilis, or some other organic lesion of the nervous axis. Cheatham¹⁵⁷ had a patient that as a result of diphtheria had paralysis of the accommodation, with pupillary reaction to light perfectly preserved and convergence not affected, but in whom there was no contraction of the pupil on convergence,—a condition the opposite to that of the Argyll-Robertson pupil. Pasternatski²⁸ found inequality of the pupils to exist in various diseases in the following percentages:—

Croupous pneumonia, 85; heart-diseases and aortic aneurisms, 61; pleurisy, 52; chronic catarrhal pneumonia, 38; acute articular rheumatism, 25; catarrh of the respiratory passages, 25; scurvy, 16; typhus, 16; recurrent typhus (relapsing fever), 15; abdominal typhus (enteric fever), 13. Inequality of pupils was also found in half the cases of catarrhal and hepatic jaundice and renal colic. The differences in croupous pneumonia are dependent upon the stage of the disease, rising toward the crisis of the disease, but decreasing or even disappearing just before the crisis. During the stage of resolution the pupil of the affected side becomes contracted, instead of dilated as it is in the early stages. Alderson⁷ adds to the list tubercular meningitis, in which his fatal cases had marked inequality and insensibility of the pupils. Rampoldi¹⁶ calls attention to bronchial and pneumonic affections as often causing unilateral mydriasis. He has noticed it after continued coughing, etc.

Salgo⁹⁵ believes that irregularly formed pupils and irregularly reacting pupils are not only of far more frequency, but are of much greater value as diagnostic signs than simple differences of size, and are of equal semeiological value with the symptom of irresponsiveness. Salgo considers that imperfection of pupillary form and reaction points to paralytic psychic disturbances, the symptom being the only one in some cases indicating the deeper lesions of the cortical substance. In chronic alcoholism and subtle-developing psychical maladies of various kinds he finds the symptom frequently present. Nettleship²¹ reports a case of monocular mydriasis without cycloplegia in a child, following severe abdominal illness, and with absent knee-jerk. In 47 per cent. of 500 cases of progressive paralysis Moelli¹⁵⁸ found the light reaction completely destroyed, completely preserved in but 28 per cent., and diminished or destroyed in 61 per cent. The pupillary paralysis existed in 84 per cent. of those with absent knee-jerk, and in 41 per cent. of those with preserved knee-jerk. Myosis is more frequent than mydriasis, and differences between the size of the pupils is often met with. Among some 1900 patients 56 were found with pupillary paralysis, in whom the general diagnosis was not clearly made out. These were kept under observation for years, and it was found that 12 to 14 developed into tabetics with mental disturbances; 8 into general paralysis; 10 into non-

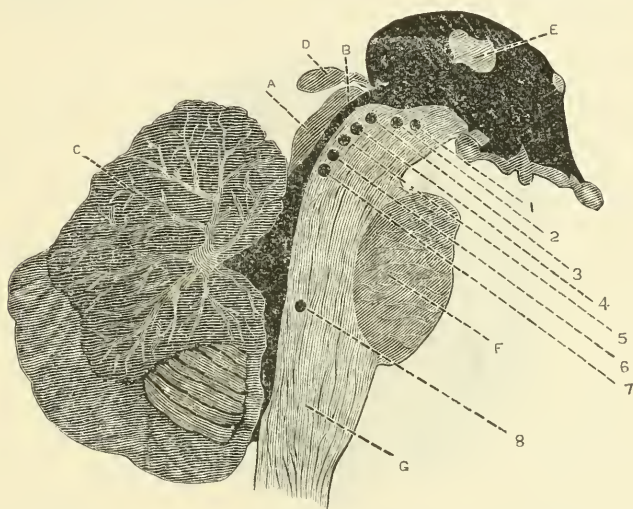
paralytic cerebral disease; 11 into syphilitic degeneration; and 7 into alcoholism. In only 1 or 2 per cent., therefore, was there binocular pupillary paralysis that did not develop general symptoms of progressive paralysis. In one-half of those that did thus end syphilis was the demonstrable source of the mischief. Hutchinson² thus summarizes the results of his examination of the pupil-symptoms met with after injuries to the head: In most cases of concussion, for a variable time, depending on the severity of the injury, the state of the pupils resembles that met with in ordinary anæsthesia produced by ether, chloroform, etc.,—*i. e.*, slowness to respond to light without marked myosis or mydriasis. In a small proportion of cases of concussion, temporary mydriasis, unilateral or bilateral, is met with. Myosis is the rule when inflammatory reaction follows severe bruising of the brain. In compression of the brain from meningeal hemorrhage, mydriasis on the side of the lesion is met with in at least half the cases, double mydriasis occurring next in order of frequency, myosis being very rare. In cases of injury to the cervical sympathetic active myosis does not occur, but the pupil on the side affected will not dilate in dull illumination.

80. *Locomotor Ataxia*.—Fournier¹⁶ thus sets forth the distinctions that may be drawn between the paralyses of the third pair due to tabes and to lesions of the nerves from other causes, as, *e. g.*, gummata :—

SYMPTOMATIC OF TABES.		SYMPTOMATIC OF LESIONS OF THE NERVOUS SYSTEM.
Immediate Symptoms.	I. Dissociate and partial paralyses, implicating the pupil, often, exclusively.	I. Total paralyses.
	II. Argyll-Robertson pupil, or myosis.	II. Different in all particulars.
Appearing during the course of the disease.	III. Temporary or even only instantaneous.	III. Persistent.
	IV. Especially subject to relapses.	IV. Not subject to relapses.
	V. Frequently spontaneous and rapid cure.	V. Cure only slowly brought about, and by specific treatment.

In a case of tabetic paralysis of the sixth, M. Déjerine¹⁵⁹ proved by microscopical examination the complete destruction of the central nucleus, with atrophy of the nerve and muscle corresponding. Suckling⁴¹ reports a rare case of double ptosis and double ophthalmoplegia externa in a case of tabes. De Watteville¹⁶⁰

also puts on record an almost, if not wholly, unique case of paralysis of convergence in the early stages of tabes. Nettleship²¹ presents cases of unilateral mydriasis without cycloplegia in an early stage of ataxia, and of wide mydriasis of both eyes for fifteen years, with only slight cycloplegia. Féré⁹⁶ observed hypersecretion of the lachrymal gland in a tabetic. According to the histories of a number of tabetic patients of Charcot, Benedick¹⁶ finds that the cases recovering are those forms accompanied by a prodromic atrophy of the optic nerve. Charcot¹⁶ does not teach that true tabetics recover, but only the cases of disseminated sclerosis, with the differences of ocular affections well known.



LONGITUDINAL VENTRICAL SECTION THROUGH THE HUMAN BRAIN, SHOWING (DIAGRAMMATICALLY) THE POSITION OF THE NERVE-NUCLEI OF THE OCULAR MUSCLES.—A, testes, and B, nates of corpora quadrigemina; C, Cerebellum; D, pineal gland; E, soft commissure in the middle of the third ventricle, which, with the aqueduct of Silvius and fourth ventricle, are represented in black; F, the protuberance of the pons; G, medulla oblongata; 1 to 6, different parts of the third nerve-nucleus, viz.:—1, centre for accommodation; 2, centre for sphincter of the pupil; 3, centre for internal rectus; 4, centre for the rectus superior; 5, centre for the levator palpebræ superioris; 6, centre for the rectus superior; 7, centre of the fourth nerve (trochlearis) for the superior oblique; 8, centre of the sixth nerve for the external rectus.—(*Edinburgh Med. Journal*.)

81. *Paralyses of the Ocular Muscles.*—In Westphal's¹⁶¹ case of chronic progressive paralysis it was found that the nerves and muscles were atrophied, and that the nucleus showed advanced degeneration. Coroenne⁶⁴ and associates describe cases of progressive ophthalmoplegia externa and accommodation paralysis following diphtheria and typhus. Remak⁷² found paralysis of the

muscles of the eye in 100 cases of diphtheria. It bore no relation to the malignity of the disease in 90 cases. In the case of Eisenlohr¹⁶² the autopsy failed to explain the reason of the progressive paralysis of the external muscles that finally ended in bulbar paralysis. The diagnosis was chronic degeneration of motor nuclei, and of the anterior gray horns of the cord. The case of ptosis and ophthalmoplegia externa in a child of two and one-half years of age, reported by Barry and Bramwell,¹⁶³ is of rare occurrence. But one case is published that, like this, ended in complete recovery. The authors trace the cause of the lesion to tubercle at the top of the pons, near the aqueduct of Sylvius. The fact that vision was not affected, and that the fifth was not



BARRY AND BRAMWELL.—OPHTHALMOPLÉGIA EXTERNA.—(*Edinburgh Med. Journal*.)

involved, nor other motor nerves, shows the lesion to have been central, whilst from the normality of the pupil it is shown that it was not the trunk of the third, but only the nuclei of the external muscles that was affected. The case is therefore confirmatory of the general results as to the special localization of the nuclei lately established by Hensen and Völckers, and Kahler and Pick. There was no distinct evidence of syphilis or tubercle; iodide of potassium was the drug effecting the cure. The relations of the nuclei are shown in the diagram on the preceding page. The first and second were not affected according to the theory of the localization of the lesion, which began with the nucleus of the internal

rectus and extended to that of the external, which, however, was but partially implicated. The appearance of the face before and after treatment is shown in the figures.

A case showing almost the same clinical features is reported by Kojewnikoff.⁵⁵ The autopsy showed capillary hemorrhage with softening of the gray matter limited to the floor of the fourth ventricle, the confines of the nucleus of the third nerve, and aqueduct of Sylvius, extending symmetrically upon the two sides.

A somewhat curious case of recurring temporary paralysis of the third nerve complete, following migraine, is reported by Suckling.¹⁶⁴ The attack lasted about two days, and recurred about every fortnight.



BARRY AND BRAMWELL,—OPHTHALMOPLÉGIA EXTERNA.—(*Edinburgh Med. Journal.*)

Caudron⁴⁶ had a case of double ophthalmoplegia in a drunkard. Lawford's case⁴¹ was connected with no history of syphilis, and no other sign of cerebral or spinal disease. It was bilateral, with ptosis, the internal muscles not affected, but the globes almost absolutely motionless. Mr. Hutchinson's case⁴¹ of ophthalmoplegia externa and interna was due to extensive syphilitic inflammation about the cavernous sinus. In the case reported by Donath⁹³ uncomplicated ophthalmoplegia interna of one eye yielded to the iodide, but as it did so the internal muscles of the other eye became paralyzed in the order and proportion of the relief of the eye first affected. There was finally complete cure. Mittendorf,¹¹ in pre-

sending a case of uncomplicated bilateral paralysis of the external muscles, reviews the literature of the subject. Drs. Moyer and Hinde¹²⁸ report a case of periodically recurring oculo-motor paralysis, the attacks growing in frequency, and recovery not being so complete of late. Sixteen such cases are said to be recorded. The case of Senator¹³³ is remarkable for the completeness of the paralysis, internal and external, for its long continuance, that it affected but the one eye, and that a cure seems to have been effected with no complications or sequelæ. The author inclines to the belief that an hysterical element existed in his case. An excellent review of the literature is appended. Gowers⁷ classifies the palsies arising from one-sided diseases of the pons into three kinds: 1. Palsy of the sixth nerve itself as its fibres cross the pons, producing simple inaction of the external rectus and inward strabismus. 2. Disease of the nucleus itself, followed by loss of the associate action of the opposed internal rectus, whence inability to rotate the eye inward when looking to the side upon which the lesion of the pons is situated. 3. When the lesion is above, presenting peculiar disturbances of the conjugate movements according to the nuclei involved. Ayres⁵⁸ reports a case of complete congenital paralysis of the ciliary branch of the third nerve, *i.e.*, paralysis of the sphincter under accommodation, whilst the nerves controlling it under light stimulus remained intact,—the exact reverse of the Argyll-Robertson pupil. Chisolm¹⁹ had a case of congenital paralysis of the sixth and seventh pair of nerves in an adult.

82. *Ocular Manifestations of Sundry Encephalic Lesions.*—Zellweger¹³² had two cases of cerebral disease that he considers confirm the theory of Deutschmann as to the origin of optic neuritis. One was vascular meningitis, the other a sarcoma of the temporal lobe, both accompanied by a descending neuritis. The irritating materials are believed to be carried by the lymph-stream from the source of infection to the base of the brain, and to the optic nerve-sheaths, and are arrested at the papilla and there set up inflammation. The author demonstrated the course of the currents as described by injections in rabbits of sterilized solutions containing cinnabar, carefully avoiding any increase of pressure by the experiment. In three days the cinnabar was found blocked in the subvaginal space behind the papilla, and later in

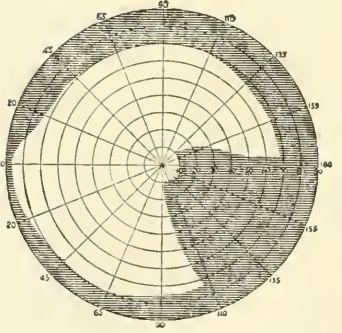
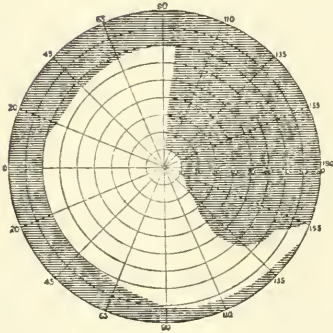
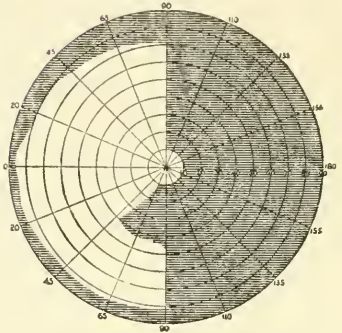
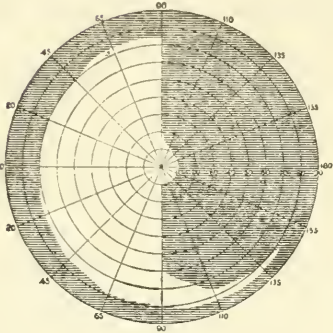
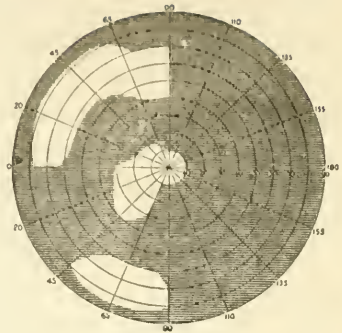
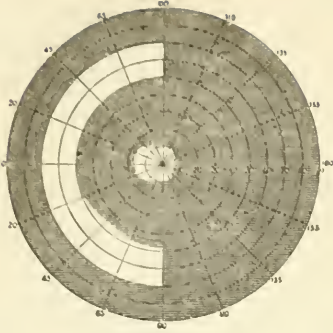
the inner layers of the dural sheath, but in no case in the papilla, retina, or nerve itself. In explanation of the irido-choroiditis following epidemic basal meningitis, Boy¹⁶ thinks the infecting material reaches the eye either through the anastomotic connections with the optic nerve in the vitelline membrane, or through the lymphatic connections of the choroid and the lymphatics of the sheaths of the nerve. Eight cases are described. Nettleship,²¹ citing three cases, refers to blindness following infantile meningitis, without ophthalmoscopic changes. The mechanism of the process is not known. The progress of recovery is noteworthy: sight returns before other muscular functions, and use of the legs is the last to return. Leahy¹⁶⁵ had a case of chronic cerebral disease with papillitis and extensive complications. Recognizing the syphilitic origin, prompt and remarkable improvement followed the treatment. Workman⁶² had a case of blindness following an attack of right hemiplegia, without intraocular lesion, and probably due to embolism in the corpora-quadrigenima, or optic thalami. Lemoine¹⁶⁶ details five cases of blepharoptosis with lesion of the angular gyrus. Collignon¹⁴² had a case of total blindness in the beginning of an attack of general spinal paralysis, with subsequent recovery under iodide of potassium. Spalding³⁴ cautions against pension claimants who allege blindness following sunstroke, and says that only one such case is on record, whilst six other cases, accompanied by optic neuritis, finally recovered perfect vision. Guerlier¹³⁸ describes an epidemic of paralytic vertigo, accompanied by ptosis, affecting workmen in the heat of summer. The ptosis persisted for a time after recovery from the stroke, the headache, etc. Nettleship²¹ describes three cases of infantile blindness from gross disease of the choroid, with smallness of cranium, premature closing of fontanelles, and ridging of sutures, but without assignable cause.

83. *Hemianopsia*.—Pooley³² had a rare case of complete recovery under iodide from an attack of left-sided homonymous hemianopsia. Griffith,⁴¹ describing several cases, concludes that permanent hemianopsia indicates grave organic cerebral lesions. Griffith's cases of bitemporal hemianopsia¹⁰⁵ are of interest, and one case especially so, as it shows the wisdom of perimetric examination with colors,—a proceeding which we think too often omitted in the hurry of routine practice. In the case alluded to

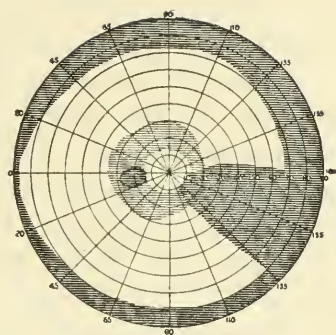
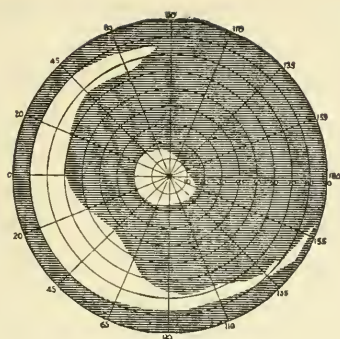
there was temporal achromatopsia for red and green, whilst normally responsive to white and blue. About 47 of these cases are now on record. In the 12 cases of Wilbrand, the causes of the pressure upon the chiasm were: in 6, tumor; tubercular nodule, 1; gumma, 2; cyst, periostitis, and meningitis, each 1. No autopsies followed Griffith's cases. One case became blind, one remains unchanged, one greatly improved under iodide, and another improved without specific treatment. Story's case⁴¹ of optic atrophy in one eye and temporary hemianopsia of the other eye led Mr. Nettleship to remark that a similar case showed at the autopsy a tumor of the pituitary fossa; and Dr. de Schweinitz reports another case with the same peculiarities as existed in the previous case,—a tendency to drowsiness and fattiness of the body. In the last case there was also excessive sweating of the hands and feet. Berry's patient⁷ had recurrent attacks of bitemporal hemianopsia, with the usual headache and drowsiness. In Kahler's case¹⁶⁷ the dividing line went perpendicularly through the fovea, and in one of the two cases reported by Rumschewitsch¹⁶⁸ diabetes was a complication. Burnett⁵¹ gives the interesting details of two cases of ring-scotoma that, from their relations with hemianopsia, and with more central lesions than the eye itself, may be included here. A noteworthy fact about both cases is that, however the outlying field may vary, central vision remains undisturbed for a distance of 10°. In the first case there seems no regularity of contour of the ring-scotoma, which, under the influence of specific treatment (doubtful history of syphilis in a rheumatic of sixty), continually changed its shape and extent during the period, about two years, of observation. The second case (syphilitic) shows decided hemianopsic, but broken, fields during the early stages of observation, though in the course of two years frequently fluctuating, and finally losing almost all traces of hemianopsia. The fact that in all such cases the subjective defect does not correspond with the choroidal lesion, if such lesion be present, at once points to an origin beyond the globe. In one case little or no lesion was discoverable in the fundus oculi. The fact also that the changes show an accurately limited respect for the central field points to the retro-bulbar origin. Burnett holds that the perimetric results prove a varying pressure on the tracts, chiasma, or nerve-trunks, rather than an exudation of the choroid; but the sharp hemiopic

delimitations that sometimes appear would, to us, suggest disturbances at the occipital visual centre. The changes of the fields in the second case are shown in the illustrations on pages 148 and 149, from electrotypes kindly loaned by Dr. Burnett.

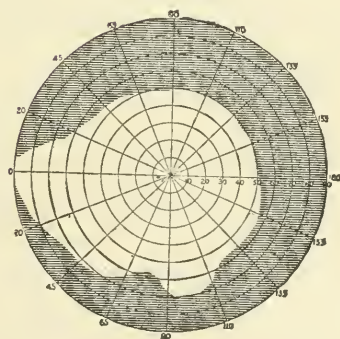
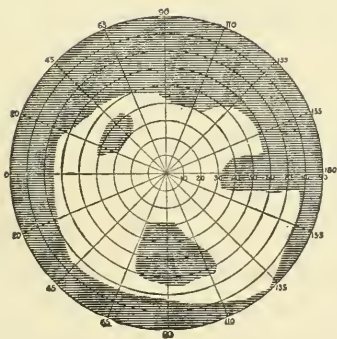
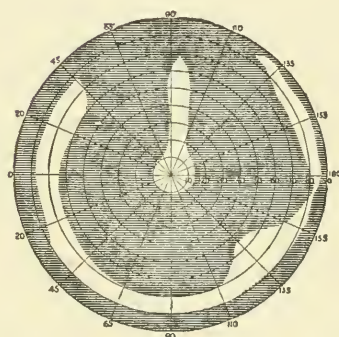
It may not be inappropriate to notice in this place a hitherto unpublished method of Thomson in the diagnosis of scotomata. That difficulties and unsatisfactory results often attend perimetric examinations is a fact that hardly needs mention. Light sensitiveness soon tires in the anæmic and in those with retinal or central disturbances; the patient wearies of the continuous fixation; in many the replies are not unfrequently contradictory or deceptive, with even the best intention, etc. Moreover, it consumes time, and one side of the perimeter is often shaded. When a record is desired, of course nothing but the perimeter will do; but it frequently happens that we wish a check upon the perimeter, or yet more frequently that we wish only a preliminary test to prove the integrity of the field, the general position of scotomata, or a comparison of the choroidal lesion with the scotoma. Such a comparison can be made by the plan to be described, and in such a way that whilst the patient replies as to his subjective impression the oculist with his own eye notes the location of the stimulus eliciting the reply. The method pursued is this: While, *e. g.*, making the preliminary ophthalmoscopic examination, withdraw the patient from one to two metres from the light, and with the concave mirror of the usual ophthalmoscope (or better still, possibly, the plane mirror, and at a less distance from the flame, thus gaining a smaller image and with less difficulty) examine the fundus by the reduced, direct image gained by the distance from the light. The stimulus can thus be reduced to a mere point of light, especially if there be a diaphragm over the Argand burner limiting its raggedness of outline. The greater the distance the smaller the image, and likewise the weaker. One may, for example, throw this point of light upon the papilla (and it as many times smaller than this insensitive spot) or upon the papilla borders, upon opaque nerve-fibres, conuses, staphylomata, pigment-spots, etc., and thus at the instant compare the patient's reply with the position of the flame-point. If we wish to test color response, a plane colored lens may be slipped in the ophthalmoscopic clip, or over the diaphragm of the Argand burner.



BURNETT'S RING SCOTOMA. (B .ocular.) (Transac. Am. Ophthal. Soc.)



NORMAL FIELD.



BURNETT'S RING-SCOTOMA. (Binocular.) (*Transac. Am. Ophthal. Soc.*)

84. *Hysteria*.—Finkelstein's study¹³² of three men and fifty-three women is thus summarized:—¹³⁴

1. The fields of vision undergo a (mostly regular) concentric narrowing. 2. The latter is the more considerable the more severe the affection is. 3. The fields of color vision also present a concentric contraction which usually (in 84 per cent.) takes place without any change in their physiological relative extents. 4. The falling out of all fields of color-vision is met only in most severe cases of hysteria, but that of one of the fields of vision is not uncommonly observed. The field for green falls out most often. 5. Perversions of color perception are very frequent and extremely varying, but they do not possess any feature characteristic of the affection. 6. Paracentral scotoma (for green alone, or for all colors) of a fairly mobile character is met in hysteria not unfrequently. 7. A rapid exhaustibility of the retina in hysterical subjects is observed by far more commonly than in the epileptic. 8. The functional activity of other sense organs in hysteria is always either impaired or destroyed, the greater functional disturbance being invariably found on the side of a greater contraction of the visual fields. Dr. Peck had a case of hysterical amblyopia in a male in which the patient complained particularly of the greatly magnified appearance of objects. "Psychical treatment" brought relief. Peck points out that, of the seventy-seven reports of hysteria in the male of the Surgeon-General's Catalogue, thirty-five are made by French authors, and only three by Germans. Solas' case of hysterical amaurosis had continued for two months, and was finally cured by suggestion in mesmeric sleep. At first she could be made to see only during the sleep, but would not see upon waking till after repeated command had resulted in a compromise.

Potain¹⁶ considers monolateral hysterical ocular affections to be dependent upon saturnine intoxication, and in imitation of the experiments of the transfer of anæsthesia, etc., from one side of the body to the other by the aid of a magnet, he has been able to switch the hysterical amblyopia of one eye over to the other. Borel⁴⁶ contends that he has several times produced convergent strabismus by suggestion in the somnambulic state. If the patient be awakened in this condition the diplopia, etc., is so persistent that the patient has again to be put to sleep in order to suggest

the normal direction of the visual axis. To cap the climax it is contended that a hysterical astigmatism, due to the partial contraction of the ciliary muscle, is producible in the same manner. In his more extended study⁸⁵ Borel concludes that no case of total hysterical paralysis of the ocular muscles is reported, and that as to separate muscles there may be a loss of the muscle sense just as in other muscles. In this condition it is impossible to know the position of the eyes because of the lost feeling of muscular tension. Experiments in tenotomy and advancement, and in the production of sundry forms of strabismus, are also described in detail, and, lastly, the transference of a strabismus from one patient to another by the aid of a magnet. Borel thinks some of Stevens' patients should be classed among the hysterical.

85. *Headache*.—Since Thomson, over fifteen years ago, began calling the attention of the profession to the great frequency of the production of headache and other nervous disorders from eye-strain, there has been a remarkable advance in the general recognition of the fact. To-day the knowledge is so widespread that in attempting any review of the literature, even for a single year, the references accumulate rapidly. Stevens¹⁰⁹ says he has treated 1280 cases of chronic headache in his private practice, and as a sample of the success attained, he finds that in 100 consecutive cases relief of the ocular strain permanently relieved the headache in 83.6 per cent., improved it in 12.4 per cent., but failed in 4 per cent. In a study of 162 cases whose histories could be traced. Amidon¹⁰⁰ deduces the following conclusions:—

1. Patients in whom insufficiency of the internal recti muscles is a prominent defect are very apt to suffer from sensory disturbances in the occiput, nucha, shoulders, and back. These disturbances may take the form of acute or dull pain, a heavy pressure feeling, or various paræsthesiæ hard to describe, and at times exceedingly annoying to the patient.

2. Patients in whom insufficiency of the other recti is prominent do not appear to be subject to occipital disturbance, but, next to asthenopic symptoms, which are almost always present, seem to suffer most from vertigo, diplopia, and confusion.

3. In hypermetropia and hypermetropic astigmatism the most frequent complaint, aside from asthenopia, is of frontal headache.

4. In myopic and mixed astigmatism, frontal, temporal, and general headaches are about equally common.

5. In cases combining hypermetropia and myopia with presbyopia, frontal, temporal, and occipital headaches and vertigo are present in about equal proportions.

6. In pure myopia and presbyopia nervous symptoms are seldom prominent.

Of 1000 cases of refractive errors, Bickerton¹⁴⁰ found that in 277 headache was a distinct symptom. His lecture on the ocular sources of headache, with an excellent gathering of clinical illustrative cases, is one of many that the profound importance of the subject has called out from numerous physicians during the year. Other praiseworthy efforts to popularize the subject are such as that of Culver¹⁷⁰ on convergence anomalies, with a dozen cases, showing how frequently these may play a part; of Ayres,⁵⁸ succinctly making clear how fertile a source of asthenopia and cephalalgia are the various forms of eye-strain; of Bane,¹⁷¹ emphasizing the same moral; of Chisolm,¹⁵⁷ Higgins,⁴¹ etc., etc. Sinclair³⁴ lays particular stress, in his excellent paper, on these causes as prolific sources of the headaches of youth, and Grandclement¹¹⁶ preaches a much-needed lesson against the same evils caused by crowding too much eye-work on school-children. Parinaud¹⁴² draws a distinction between ocular cephalalgias in which the eyes are at fault, and upon the correction of the eye-strain the headache ceases, and such as are really caused by an abnormal condition of the nervous system, but secondarily called out by use of the eyes. The first he calls true ocular cephalalgia; the second, neuro-ocular cephalalgia. The conditions producing the first class of cases are the common ones we all know; hysteria, neurasthenia, adolescence, extreme school-work, etc., are given as predisposing causes of the second class of cases. Buller²² thinks insufficiency of the inferior or superior recti is more frequently the source of headache than commonly supposed. Norton²⁷ reports a number of cases in which prompt improvement and relief of asthenopia and headache followed the correction of as low degrees of astigmatism as 0.25 D. Such cases occur most frequently among children and young women. Webster¹⁷² records the complete and permanent relief (fifteen years) of a case of extreme headache by a tenotomy. Sinkler¹⁰² describes a case of *migraine* (sick-headache) in a child

of seven, due to eye-strain. Charcot,¹⁷³ it is said, finds ophthalmic migraine divisible into two classes: simple, manifested by headache and visual disturbances, and concomitant, with aphasic, sensory, and motor disturbances in addition. The treatment is simply large doses of bromide of potassium. It is evident that the term *ophthalmic* is used only as designating a symptom that is but accidental and transitory. Why, then, use the term? And what is to become of those instances where eye-strain is the predominant etiological factor? Müller-Lyer¹⁷⁴ says scintillating scotoma and hemianopsia are the characteristic symptoms of ophthalmic migraine, and gives two illustrative cases in detail. Liégeois¹⁷⁵ describes a case in which there was no hemianopsia, and that, after persisting seven to eight times a year for thirty-eight years, ended in a spontaneous cure. Dr. Suckling's¹⁶⁴ peculiar case of migraine attacks followed by temporary paralysis of the third nerve was cured by thirty-grain doses of guarana. Ranney⁶⁷ describes three or four cases of sick-headache relieved by correction of the eye-strain, and says, "I have yet to meet a case of typical migraine in which a marked error of refraction or a serious muscular anomaly in the orbit did not exist." Stevens¹⁶⁹ says that in migraine there is often a complicated state of refractive trouble and muscular insufficiency demanding great care and judgment in correcting the ocular conditions. With sufficient accuracy in relieving these defects, however, sick-headaches will, in the great majority of cases, cease. A number of cases are described wherein correction of the ocular defect brought relief. Stevens¹⁶⁹ claims that *neuralgia* is frequently curable by correction of the ocular defects, and out of 850 cases (!) in private practice he chooses 100 consecutive cases, and finds that of these 83.53 per cent. were permanently relieved, and 11.76 per cent. materially improved. However prone we may be to believe in the interdependence of pathological conditions of the eye and the nervous system, we cannot withhold our ballot that such figures as these seem as if a praiseworthy desire to discover and demonstrate a great truth had (doubtless unintentionally enough) led either to careless interchanges of *post hoc* and *propter hoc*, or to a too-enthusiastic reading into the facts of unwarranted conclusions. And this is especially true where such iteration and emphasis is indulged as to the brilliant results of tenotomy. In our experience the proportion of

eases with insufficiency of the external ocular muscles cannot be made to mount so high, analyze the figures as we may.

The occasion may be caught to note that conservative physicians cannot but look with some suspicion upon what seems to be a growing recklessness of assault upon the ocular muscles. The affections to which these muscles are peculiarly liable are, in the vast majority of cases, but secondary and symptomatic of lesions that are often distant, almost always mysterious, and, above all, changeable. Experience daily teaches us more and more plainly that these delicate structures have often to bear the brunt of a derouted reflex neurosis; that their innervation may, in multitudinous ways, be interrupted by pathological conditions in the course of the nerve or at its nuclear origin. The considerate neurologist and physician looks behind these external symptoms to the things they point out, and he seeks the uncorrected ametropia, the reflex neurosis, the meningitis, the syphilitic, gouty, or rheumatic virus, the blood or nerve poison, the kidney or spinal disorder, that lies beneath. Tenotomy cannot cure the amenorrhœa that causes ptosis or diplopia; it is powerless over the hyperopia that we have so often seen produce persistent headaches and neuralgias, possibly even choreas and epilepsies; if syphilis be the father of "insufficiency," surgery is not needed. And so through the list! Those who have most profoundly studied the almost-impenetrable problems presented by the ocular muscles come to recognize that, however grows our knowledge, the wisest knows but a few of the mysteries of their pathological functions. These may all be truisms, trite as they are true; but there seems a dangerous tendency to ignore or forget them.

86. *Chorea*.—Dr. Culver,¹⁷⁰ in a most excellent report, gives the details of a pronounced case of chorea that had stubbornly resisted other treatment yielding promptly to correction of ametropia and orthoptic training of the internal insufficient recti; a slight recurrence of the affection at a later date induced him to perform tenotomy of the external rectus, and the cure was unconditional. Ranney⁶⁷ refers to one or two cases relieved entirely by correction of the ametropia. Stevens,¹⁶⁹ in 118 cases of chorea, found simple hyperopia in 78, hyperopic astigmatism in 13, mixed astigmatism in 5, myopic astigmatism in 11, myopic anisometropia in 6, and muscular disability in quite a number of cases.

The histories of several typical cases ending in complete cure by relieved eye-strain are given. There can be no reasonable dissent made to the general statement that chorea is a nervous trouble often depending upon ocular conditions. A clinician of the trained and conservative judgment of Da Costa has for years taught his classes the importance of eye-strain as an etiological factor in the development of chorea, and has shown several examples of such successful treatment of ametropia. (It seems a pity these have not been reported.)

87. *Epilepsy*.—Ranney,⁶⁷ from a study of 100 neurotic cases, concludes that there is a relationship existing between the anomalies of the visual apparatus and the so-called neuropathic tendency, and the following propositions are laid down:—

1. No one has yet shown in what this predisposition to disease lies; hence it can be shown that eye defect is an important element in these conditions, and one in which great advance has been made.

2. There is no recognized pathology in functional nervous diseases. The view that they are “constitutional diseases” is by no means established by pathological research.

3. Heredity is very common in those affections. It is one of the marked features in this class of nervous diseases.

4. My records go to show that eye defect is found in a very large proportion of such subjects.

5. Many of the eye defects found can be shown to be congenital, being inherited like other facial peculiarities.

6. The manifestations of the neuropathic predisposition vary with each case. They are called forth often by extremely trivial circumstances, or simple coincidences are too frequently regarded as of great clinical interest.

As to epilepsy, Ranney³² has treated 16 cases of the neurosis in one and one-half years, and in only two cases was there emmetropia, in only one no defect of the muscles. Eight were operated on, with three complete cures, and five improved, but yet under observation. Here, as so often in such cases, there is the same provoking emphasis as to the muscular insufficiencies, with the same exasperating silence as to the ametropic corrections. We frankly confess that in our belief the latter are infinitely more important than the tenotomies and advancements, and one cannot

help wondering at the claim of cures as due to these last, whilst ignoring the part played by the ametropic defect. Stevens¹⁶⁹ has had 140 cases of epilepsy. In 100 consecutive cases there was hyperopia (including hyperopic astigmatism) in 59, myopia in 23, and emmetropia, or a less refractive error than 1 D., in 18. Twenty-nine cases (out of 89 private) have been treated by removal of ocular defects alone. Of these, 14 or 16 may be considered permanently relieved, 11 varyingly improved, 2 not helped. Elsewhere,³² it is said, out of 64 consecutive cases of one to many years duration, remedy of the ocular defect with discontinuance of medicines has resulted in 32 cures (several months to several years free from attacks), and 21 markedly improved. Typical cases, illustrating in detail the conditions, are given, the results of which, with pictorial aid, are certainly striking. As a result of the operations upon 10 epileptics in the Willard Asylum for the Insane,³² it was found that during the month preceding the operations there were about 170 convulsions; whilst during the month following the operations there occurred in the same patients but 40, and this with the withdrawal of the bromides. Schleich⁶⁸ found the epileptics of the Würtemberg Asylum remarkably free from ophthalmoscopic lesions, but there was frequent hyperopia and strabismus. The idea that these ocular defects might possibly play a part in the production of epilepsy does not seem to have crossed the author's mind. Oliver¹⁷⁶ thus sums up the results of his examination of the epileptics of the State Hospital for the Insane at Norristown, Penna. :—

1. Direct vision for form, as a rule, normal in both emmetropia and corrected ametropia.

2. Accommodative action normal in due proportion to age and refractive error.

3. Visual fields for form and color reduced from one-third to one-twentieth of normal areas.

4. Visual fields for form and color regularly diminished without any indentations or scotomata.

5. Order of color field follows the regular physiological sequence, without transposition or reversion.

6. Sub-normal color perception to a slight extent, as evidenced by faulty selection of delicate tints and shades containing low percentages of green and red.

7. Pupils are, as a rule, equal in size and alike in shape.

8. Irides freely and equally mobile to light stimulus, accommodation, and convergence.

9. Extra-ocular motion intact in all directions. The insufficiency of the interni in the majority of cases probably has no relation to the epileptic condition.

10. Optic disk superficially over-capillary, with a decided grayness in its deeper layers, showing a low grade of incipient optic-nerve degeneration.

11. Scleral ring rather more sharply cut and broader, especially to the temporal side of the disk, than in the healthy eye; this being probably due to a slight shrinkage of lowered nerve-tissue.

12. Fibre layer of retina increased in thickness, as evidenced by dense and coarse massings of striation extending in all directions from the disk, these being more particularly marked in the superior and inferior portions of the eye-ground, even hiding the edges of the disk itself in many instances.

13. Retinal vessels large in size and carrying rather dark-colored blood, this being more pronounced than usual with the veins.

14. Retinal veins exceedingly tortuous and, in a few instances, pulsating.

15. Retinal arteries frequently wavy and sometimes tortuous, especially the temporal and macular twigs.

16. Retinal lymph channels visible in the majority of cases, particularly seen along the larger vascular distribution and at the vessel entrance as glistening and yellowish-white opacities.

17. No other visible changes of any significance throughout the eye-ground except a granular condition of the choroid in the macular region.

Comparison of Dr. Oliver's results with the report of Finkelstein to follow, and with that of Schleich referred to above, starts some evident queries. It seems a matter of regret that as careful an estimate of the refraction was not made. Fere found 24 cases of nystagmus among 170 epileptics, and frequently accompanied by strabismus, inequality of pupils, etc. What are the facts in this respect? We are again indebted to the *Provincial Medical Journal* for its *résumé* of Dr. Finkelstein's valuable researches¹³² as to the sensory disturbances in epilepsy:—

Forty-one men and 21 women, aged from 11 to 67. 1. The fields of vision undergo a general concentric narrowing under the influence of the fits. 2. There are two varieties of the constriction: (*a*) a more or less regular or equal narrowing of both halves of visual field; and (*b*) a more or less hemianoptic narrowing. [In 53 of 62 patients a regular contraction, in 8 a hemianoptic, and in 1 an irregular was present.] 3. All radii of the field are diminished, but the internal radius undergoes the greatest shortenings. 4. The constriction fully coincides in time of appearance with general premonitory symptoms of the fit (giddiness, headache, cardiac palpitation, etc.). 5. The greatest narrowing, however, is observed immediately after the fit. 6. The narrowing lasts for two or three days after the fit, and then (provided no further fits occur) gradually disappears to give place to the normal state of things. [The author never saw a permanent constriction of the field, even in the most severe cases.] 7. Stability of the narrowing is dependent solely upon intensity of the fit and duration of the disease. 8. The constriction of the fields of color vision occurs invariably in all cases, and is still more pronounced than that for white color. 9. The greatest diminution after the fit is manifested by the field for green, the least by that for blue, while those for yellow and red stand between. 10. In a majority of cases (in 61.3 per cent.) a perversion of color perception is also observed. The perversion of green (which color is then seen yellow) occurs most often; the perception of yellow suffers less frequently; that of red and blue is perverted even more rarely. 11. After the fit the fields of color vision gradually return to the normal, the blue field being first, the green last, to resume their normal extent. 12. The same holds true in regard to color perception. 13. After the fit there may be often observed also a falling out of one or other color from the visual field, green falling out most often, yellow far less frequently, and red very seldom. As a rule the internal radius mainly falls out. 14. The central vision grows more or less worse after the fit, to recover with the general improvement. 15. Paroxysms of *petit mal* seem to act on the functional activity of sense-organs identically with the convulsive epileptic fits. 16. There often occur after the fit scintillant scotoma and a rapid exhaustibility of the retina, which phenomena, however, soon disappear after the patient's general improvement.

17. The pupils after the fit are mostly (34 of 62 cases) normal; but sometimes they are dilated (in 11) or narrowed (in 18). 18. Hearing is usually (in 42 of 62) impaired after the fit; it may be weakened on both sides (in 19), or only on the left (14), or on the right alone (9). The bone conduction is lowered as often. 19. Smell is also affected very often (in 41 of 62). It may be weakened on both sides (13), or on one side (17), or perverted (2), or totally destroyed (9). 20. The same is true in regard to taste, which becomes either weakened (32), or perverted (12), or is destroyed altogether (2). 21. The patellar reflex is slightly increased immediately after the fit; but subsequently rapidly decreases, to return to the standard only two or three days later. 22. The post-epileptic changes of the visual fields and perversion of color perception may prove of use as a means for diagnosing a true epilepsy from a simulated one.

Frothingham² reports a case of chronic epilepsy in which correction of the hyperopia of 2 D. was followed by disappearance of the seizures. Pechido⁴⁶ records a case where regular epileptic seizures were relieved from the day of the enucleation of a soft, blind globe.

88. *Mental Disorders.*—Lautenbach²⁵ studied the ocular condition of more than 1000 insane, and finds vision for form practically normal; visual fields reduced from nerve degeneration; pupils frequently unequal, irregular, and sluggish; insufficiency of the recti muscles only exceptionally frequent in imbeciles and idiots. The condition of the optic nerve differed according to the varying intensities of the three stages of mental unsoundness, melancholia, mania, and dementia. In the first stage, retinal hyperæmia, or congestion, with enlarged vessels, tortuous veins, etc., is the almost invariable rule. In acute mania the congestion may rise to effusion; or atrophy may supervene, and in dementia the atrophy is more marked, with decrease of blood supply even to most extreme degrees. Oliver⁵¹ examined the eyes of twenty healthy male adult imbeciles, finding them capable of proper functional activity. He thinks that the various conditions known as insufficiency of the interni,—dirty red-gray appearance of the optic-disc, irregularity of physiological excavation, non-visibility of the superior and inferior portion of the scleral ring, absorbing conuses in all of their varieties, increase in density and thickness of the retinal fibres, opaci-

ties of vascular lymph-sheaths, disturbed states of the choroid, and gross errors in astigmatism with changes in indices of refraction,—which are so frequent in the used eye of the mentally healthy, must be considered as pathological changes, expressive of low inflammatory action, with stretching and distortion from increased intraocular and extraocular pressure; these being representative not only of general want of tone so often seen amongst those of sedentary life, but of constant and frequent abuse of a delicate organ.

Coudberg⁸⁶ describes eight cases of mental maladies in which there was marked conjunctivitis concurrent with the seizures or exacerbations, and the conclusion is drawn that only in chronic cases does this phenomenon appear. Stevens¹⁶⁹ gives the details of five cases of acute mania (with two sets of photographs) completely relieved by correction of the eye-strain. Berlin¹⁷⁷ had six patients incapable of reading but a few words at a time. Speech was normal, and so was the condition of the eyes. He calls the affection dyslexia, a trouble of central origin, often complicated with hemianopsia, or hemiplegia, and of grave prognosis. Wilbrand's masterly pamphlet¹⁷⁸ on the subject condenses all that is known about the relations of alexia, agraphia, psychical blindness, and homonymous hemianopsia. The explanation of the peculiar effects by the anatomical lesions are of exceptional interest, but cannot be entered upon here.

SECTION VI.

REFRACTION, MATERIA MEDICA, INSTRUMENTS, ETC.

89. *Myopia*.—The comprehensive work of Stilling¹⁷⁹ is not only the most important work of the year upon the subject of the origin of myopia, but it is doubtless the best that exists. Four rival theories have been advanced,—1, that explaining the condition as the result of accommodation-strain; 2, that from convergence-strain; 3, from tension of the optic nerve in convergence; and, 4, from inflammatory processes. No single theory can be exclusively accepted. All of the author's conclusions are based upon extensive anatomical observation and experiment made upon the dead body,—a most laborious task, indeed. Proceeding from

the evident fact that myopia is the result of near-work, the functions of the muscles and their influence upon the globe are examined, and it is found that the only one of all that can exercise any considerable strain upon the attachments of the optic nerve is the superior oblique; and from this results the conclusion that myopia is the product of increase of axial diameter under the influence of the muscular tension or compression of the superior oblique. In all highly myopic eyes the traction is transverse. Conus is also of course a product of the same tension or compression. If there be tension without compression there will be conus without myopia; if compression without tension, there will follow myopia without conus; if both forces exist, both results ensue. The form of the globe is dependent upon the habitual results of the muscular forces, and these depend almost entirely upon the very varying insertion of the obliquus superior, upon the height and position of the pulley above the globe, etc. The conus is therefore no infallible characteristic of the myopic eye, but is more frequently present in such eyes because in near-work the superior oblique is more persistently in action. Axial diameter is not an absolute sign of myopia either (in medium degrees not differing from that of normal eyes), but only a relative one; and the radius of the cornea, differing greatly in different eyes, is the dominating factor. It is generally speaking greater in the higher degrees of myopia. In myopic eyes there also exists a greater development of the external ocular muscles, and a relative distortion of the normal positions of optic-nerve entrance and globe, resulting in conus and staphyloma posticum, which last ophthalmoscopically is not an atrophic portion of the choroid with the sclera shining through, but is simply an optical phenomenon. The choroid at this point shows anatomically no evidences of atrophic or inflammatory processes. Myopic eyes are divisible into two classes.—those slightly but not abnormally or pathologically misshaped, and those that are so deformed. The latter class, the hydrophthalmics, represent the glaucomatous process in youthful yielding globes. Such eyes are diseased not because myopic, but are myopic because diseased. In the non-pathological variety the myopic development comes to a standstill with the end of the period of general growth, and it is not connected with impaired acuity unless from astigmatism, corneal, lenticular, or retinal. As

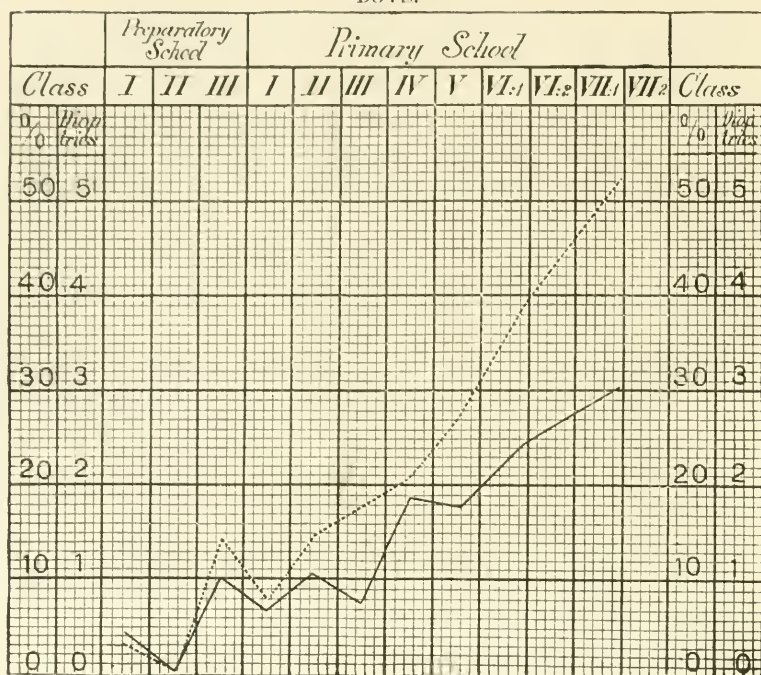
regards the heredity of myopia, it is thought nothing more than a predisposition is inherited; but as the high orbit presupposes a different line of insertion and traction of the superior oblique, and the narrow orbit may even compress the globe, and since the orbital and cranial shapes are decidedly hereditary, it follows that the predisposition is nearly equal to a necessity. In reference to prophylaxis, we must relieve the strain of the superior oblique by giving the young less near-work, by making books and letters broad instead of tall, by inclined school-desks, by correction of ametropia, etc. Stilling believes there has arisen an exaggerated feeling of the danger and increase of myopia. He does not think the non-pathological variety of myopia is the father of the malignant, nor that the school-system is wholly responsible for it. It is, in fact, a very old condition that our modern science and art have drawn attention to. Bons and Verdesse are reported³¹ as reaching a common conclusion that cranial asymmetry exists in anisometropia, and that the more myopic eye corresponds to the most developed cranial side, at least the longest antero-posterior ocular axis is upon that side, which, moreover, is generally the right. Peterson¹³² finds myopia frequently coincident with corneal leucomata. Of 120 cases of bilateral opacities he found myopia in 76, of which 43 were lower grades, and 28 high degrees. In 66 cases of unilateral opacities myopia of both eyes existed in 21 cases, and of 1 eye in 11 cases. Pflüger⁵⁷ reiterates the complaint against the school-system, that myopia is exactly proportional to the number of hours of school-work laid upon children, and quotes the results of Seggel's examination of 2378 soldiers, that only 10 per cent. of the non-educated had myopia, whilst 60 per cent. of the student-soldiers were near-sighted. Widmark's statistics⁷ are startling. He examined 704 male and 742 female scholars of the Stockholm schools. In the first schools (six to seven years of age) there was no myope; the amount and frequency of myopia rises toward the end of the courses. The maximum frequency was 66.67 per cent. in the higher girls' school, and the maximum amount (4.16 D.) was likewise found in the girls' school. At sixteen, the general average of myopia among the girls was 33 per cent., and the average degree 2.5 D. We give on pages 164, 165 and 166 diagrammatic representations reproduced from those of Widmark, showing the results of his statistics

at a glance. In the first four tables the dotted line shows the percentage of myopic pupils, and the continuous line shows the average degree of myopia. In the fifth table the dotted line indicates the average of visual acuity corresponding to the different degrees of myopia, and the continuous line the percentage of eyes that, with the various grades of myopia, have a normal acuity.

Tiffany,¹²⁹ from an examination of 2040 pupils of the schools (of Kansas) finds that the proportions of ametropic defects are as follows: Strabismus, 0.6 per cent.; myopia, 4.6; hyperopia, 9.9; astigmatism, 2.6; spasm of the accommodation, 4.8; latent hyperopia, 3.1. In the pupils of all grades, except in the Kansas State University, Tiffany does not find the gradual increase of myopia that stands out as the result of most other investigators' work. Adler⁹³ returns to Colm's thesis with savage emphasis: "Myopia is a disease of civilization." The percentages slowly, but in definite proportions, rise from the 1 per cent. of the German elementary country schools and 10 to 13 per cent. in the city elementary schools until in the upper classes of the gymnasie it reaches 60 to 65 per cent. The increase is accurately proportional to the number of hours of study. In some cases 80 to 85 per cent. of some classes are found myopic, and Becker is quoted as reporting 100 per cent. of myopics in a theological seminary! The picture drawn by Adler is incontestably a pessimistic one. Adamjuk⁴² observed the refraction for ten years of 317 school-children. In the first year there were 52 per cent. hyperopic, 33 per cent. emmetropic and 14 per cent. myopic. In the course of the ten years there was an increase of myopia in 90 per cent. Cameron¹⁴⁰ has some practical remarks as to the lighting of school-rooms and the printing of books for pupils. Galezowski¹⁶ also discusses the questions of light, artificial and natural, the purity of air, etc.

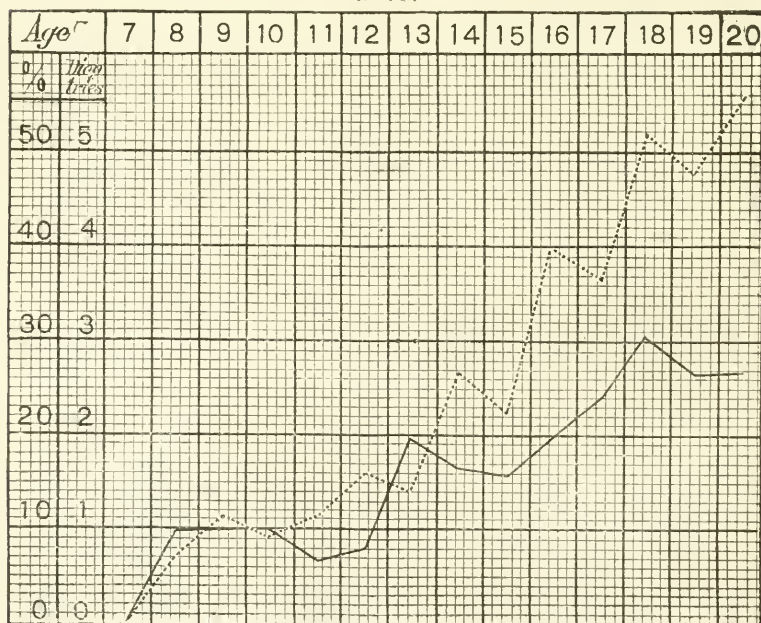
Risley¹⁵⁷ urges that there is a danger in allowing patients to choose concave glasses for themselves of an optician, and cites an illustrative case. Many writers have called attention to this, and also to the crying need of better arrangements as to light and proper school-desks. Risley⁵¹ reports nine more cases (now twenty-two in all) passing, while under observation, from hyperopia to myopia, "by the turn-stile of astigmatism."

BOYS.



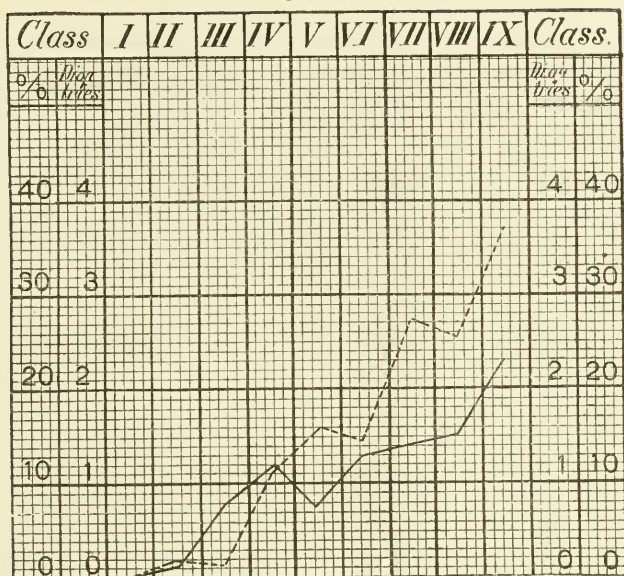
WIDMARK: MYOPIA ACCORDING TO SCHOOL-CLASSES.—(Rev. Gén. d'Oph.)

BOYS.



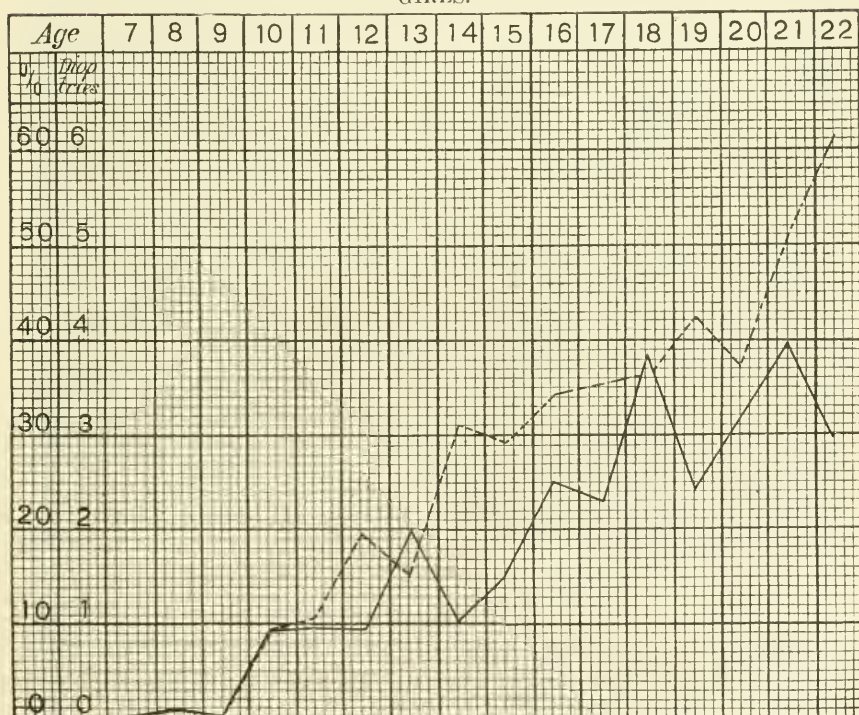
WIDMARK: MYOPIA ACCORDING TO AGE.—(Rev. Gén. d'Oph.)

GIRLS.



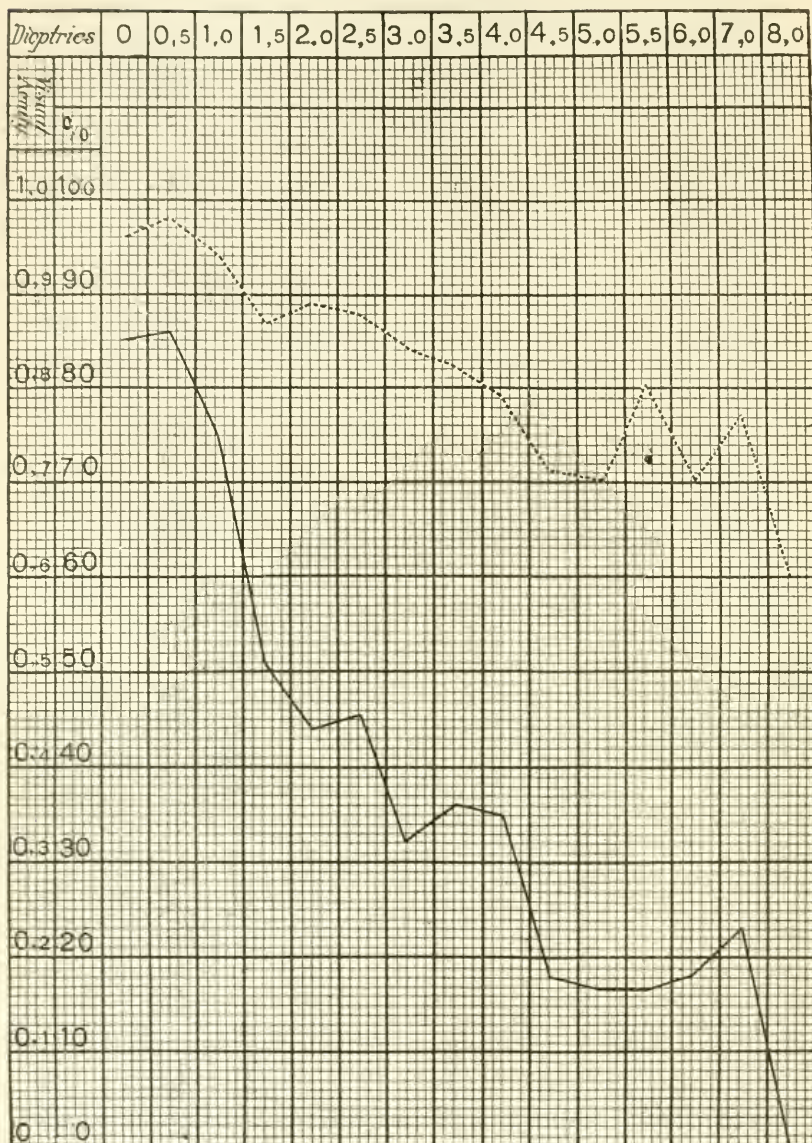
WIDMARK: MYOPIA ACCORDING TO SCHOOL-CLASSES.—(Rev. Gén. d'Oph.)

GIRLS.



WIDMARK: MYOPIA ACCORDING TO AGE.—(Rev. Gén. d'Oph.)

ACUITY OF VISION.



WIDMARK: VISUAL ACUITY AND MYOPIA.—(Rev. Gén. d'Oph.)

90. *Astigmatism*.—Coleman³⁴ finds that, theoretically and practically, it is advisable in cases of simple myopic astigmatism to give a plus cylinder with axis at right angles for near use. He

cites nine cases with details where the results have been satisfactory. Martin's studies³¹ are illustrated by a richness of clinical material that should give the results an effectiveness beyond dispute. He finds that there is often an over-correction by the lens of the corneal asymmetry in one eye from the associated contraction with the other eye, when this difference of corneal astigmatism exists to any considerable degree,—say, above 0.50 D. The associated contraction is less in degree than the primary contraction, and in 12 per cent. of cases it does not take place at all. It varies in degree from 0.25 D. to 1.00 D., and its angle does not vary greatly from that of the primary. If the secondary or induced contraction take place in an eye with a perfect cornea, there is a purely subjective astigmatism, and this is found to be more rebellious than the primary contraction. Martin claims to prove the existence in certain nervous or neurotic temperaments of an astigmatism, purely subjective or dynamic, with symmetrical cornea; he calls it spasmodic astigmatism, and says it may produce blepharitis, headache, etc., as well as the corneal or lenticular neutralizing varieties. Only prolonged use of atropine overcomes this. All eyes with posterior staphyloma are astigmatic, and the long axis of the staphyloma is parallel with one of the principal meridians, generally with the one of least refraction. (In 1875, Thomson, in treating this subject, reported that in his 120 cases of crescents the line of the crescent corresponded with the astigmatic meridian of the cornea.)

In vertical astigmatism the correcting contraction is necessarily horizontal, and therefore the tension will produce an external staphyloma, proved 336 times out of 358; and if the astigmatism be horizontal the staphyloma will be beneath, proved fifteen out of twenty-four times. Savage¹²⁸ points out an interesting peculiarity in reference to the function of the oblique muscles in cases of astigmatism where the angle is not exactly vertical or horizontal. He believes they act so as to bring the slightly displaced axis of astigmatism to the vertical or horizontal by a rotation of the globe on its antero-posterior axis. The superior oblique of one eye acts conjointly with the inferior oblique of the other to keep an object on corresponding retinal points. If, now, both axes of astigmatism are at 80, or both at 100, it is evident that both muscles are kept in a state of tonic contraction so long as an object is fixed; but

if the axis of one eye be at 80 and that of the other eye at 100, the eyes may alternate in sharp fixation, and thus each oblique muscle is allowed a period of rest while his fellow keeps up the work. With this rotation of the globe compensatory inclination of the head may take place, but where the obliquity of axis is great the strain will become all the greater if the two obliquities are the same instead of symmetrical. In the application of cylindrical glasses, therefore, the author finds a practical side to this question, and one wherein the resolution of the problem often requires most careful attention; and he believes the failure to give relief is not infrequently owing to inattention to this principle. Javal⁴⁶ finds astigmatism divisible into three classes of cases,—those with the greatest curvature vertical, those with it horizontal, and those with it at 45° . In the first class the astigmatism is almost entirely corneal, whilst in the second class it is principally lenticular, so that the total is much greater than the corneal, and it is from this class that are recruited the rank and file of the cataractous and glaucomatous. In the third class there is a decentration of the globe that may be as great as 20° or 25° , and correcting glasses only correct by means of oblique vision. From the fact that the refraction of an incident pencil of light is greater if striking the refracting surface obliquely, Dr. Jackson³⁴ urges the necessity of accuracy in correction of the ametropia, especially of myopia and presbyopia, to prevent the patient looking obliquely through his glasses to secure better vision. Another practical bearing of the fact is that patients should look through the centre of their glasses. Professor Dabney¹⁸⁰ writes of the necessity of correction of low degrees of astigmatism. The most noteworthy treatise on astigmatism that has appeared during the year is the excellent one of Burnett,¹⁸¹ containing a summary of the subject in all its bearings. The author's experience extends to 475 cases with 806 astigmatic eyes. Of these 37 per cent. had simple myopic astigmatism; 20 per cent., compound; 26 per cent., simple hyperopic; 14 per cent., compound; and 3 per cent., mixed. We agree with the author as to the little practical value of retinoscopy; but confess our inability to determine the accurate astigmatic refraction of young eyes without a mydriatic. Trial glasses, prescribed so, would seem to us both a waste of time for ourselves and for our patient.

MATERIA MEDICA AND THERAPEUTICS.

91. *Mydriatics, Myotics, and Anesthetics*.—Messrs. Lang and Barrett²¹ have made some admirable experiments concerning the action of mydriatics and myotics upon the pupil and accommodation. The practical deduction is that after mydriasis and paralysis of the accommodation have been effected by homatropine, or by the combined instillation of homatropine and cocaine, the application of eserine then causes a contraction of the pupil and an approximation of the near point to such an extent that in the great majority of cases the individual can, in a few minutes, resume work of all kinds without inconvenience. We give a table on page 170 showing the average results of their experiments with the different drugs.

Stocker's results¹⁵ in some respects differ from those of Höltzke and Gräser, especially as to the increase or decrease of tension being an accompaniment of mydriasis or myosis. His experiments were made upon curarized animals, and by the aid of an improved manometer. He finds that under these physiological conditions *atropine* slowly diminishes the intraocular pressure. With cocaine there is also a diminution of tension, two to three millimetres of the manometer, preceded, however, in the majority of cases by a brief increase. (Sargent⁴³ reports a case of the relief, six to seven months, of glaucomatous symptoms by cocaine instillations.) *Eserine* produced a temporary increase (three millimetres), followed by a final and permanent decrease greater than the primary augmentation. *Pilocarpine* at first produces fluctuations of pressure which average *plus*, but is followed by a constant and slow decrease. There is no direct relation, therefore, between pupillary diameter and intraocular tension. Atropine and cocaine have no influence upon the corneal curvature; eserine and pilocarpine lessen it to some extent. Despagne¹⁶ recommends santionate of atropine as preferable to the sulphate, because, unlike the latter, it gathers no vegetable growth in keeping. It must be kept in yellow-glass bottles. Thompson⁷⁹ finds the sulphate of *duboisia* in interstitial keratitis much better, and freer from the irritating effects of atropine. Chisolm¹⁰² had a patient in whom persistent applications of all the mydriatics failed to produce any dilatation of the pupil. [Any effect on the accommodation?] Chadwick⁵⁴ is reported as seeing decided

TABLE SHOWING THE ACTION (AVERAGE) OF ESERINE, PILOCARPINE, HOMATROPINE, AND HOMATROPINE + COCAINE.

		Pupil.		Movement of near point.		Movement of far point.		Alteration of range of accommodation.	
		Contraction.	Dilatation.	Approximation.	Recession.	Approximation.	Recession.	Increase.	Diminution.
Time of commencement of action.	Eserine.....	7.27 min.	.....	4.73 min.	.....	6.58 min.	.....	11.25 min.	5 min.
	Pilocarpine.....	13.75 "	.....	13.33 "	6.67 min.	15 "	.....	.....	5.83 "
	Homatropine.....	.....	13.33 min.	.....	.....	.....	.....	.....	.....
	Homatropine + cocaine.....	.....	10 "	.....	6.67 "	.....	.....	.....	.....
Time of maximum action.	Eserine.....	17.33 min.	.....	25.8 min.	.....	18.11 min.	.....	52.22 min.	22.5 min.
	Pilocarpine.....	22.5 "	.....	28.33 "	.....	26.67 "	63.33 min.	63.9 "	65 "
	Homatropine.....	.....	60 min.	.....	61.67 min.	53.33 "	.....	.....	59.17 "
	Homatropine + cocaine.....	.....	30 "	.....	61.67 "	50 "	77 "	.....	.....
Time of cessation of action.	Eserine.....	24-48 hrs.	.....	8 hours.	.....	55.22 min.	.....	8 hours.	8.75 hours.
	Pilocarpine.....	48 "	.....	70 min.	.....	60.83 "	.....	70 min.	.....
	Homatropine.....	.....	21.67 hrs.	.....	8.75 hrs.	.....	.....	.....	.....
	Homatropine + cocaine.....	.....	34.5 "	.....	25.67 "	.....	.....	.....	25.67 "
Amount of maximum action.	Eserine.....	.....	.....	9.89 D.	.....	4.54 D.	.....	8.24 D., i. e., 1.319 of normal range 6.20 D.	1.68 D., i. e., 0.26 of normal range.
	Pilocarpine.....	.....	.....	3.51 D.	.....	2.7 D.	.....	2.72 D., i. e., 0.36 of normal range 7.81 D.	2.96 D.
	Homatropine.....	.....	.....	.....	6.33 D.	0.42 D.	0.78 D.	.....	6.12 D., i. e., 0.86 of normal range 7.14 D.
	Homatropine + cocaine.....	.....	.....	.....	6.97 D.	0.43 D.	0.75 D.	.....	6.58 D., i. e., 0.91 of normal range 7.23 D.

The results of this table have been represented by diagrams, which we append.

Chart 1. Average action of Homatropine.

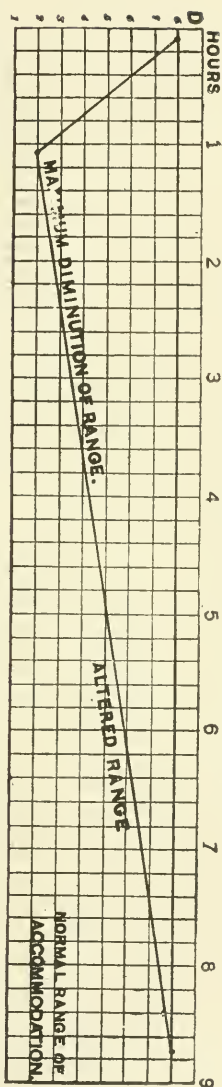


Chart 2. Average action of Homatropine with Cocaine.

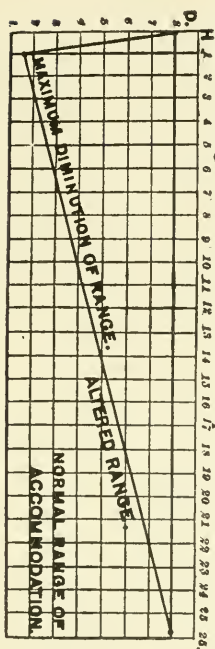


Chart 3. Average action of Homatropine with Eserine.

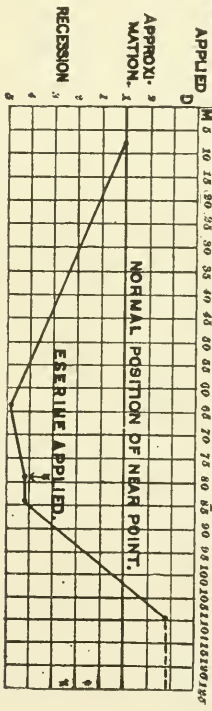
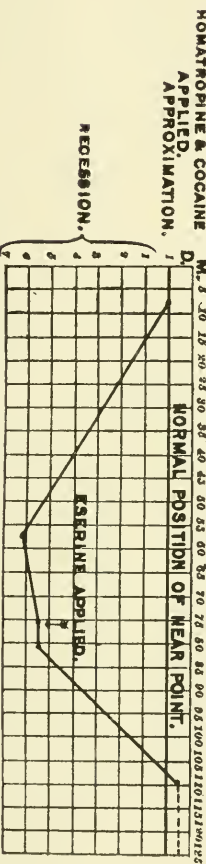


Chart 4. Average action of Homatropine with Cocaine and Eserine.



constitutional toxic or cerebral effects, in a patient of seventy-five years of age, from the instillation of $\frac{1}{100}$ gr. of *duboisia*. Tweedy⁷ finds a few drops of a one-half of 1 per cent. solution of hydrobromate of *hyoscyne* produces a rapid, powerful, and unirritating dilatation of the pupil and paralysis of the accommodation; that its action is three times as rapid as atropia, and not so easily counteracted by eserine; and that it leaves no unpleasant taste or sensation in the throat. Walter⁷ finds that hyoscyne does produce dryness of the throat and the general toxic symptoms of atropia. It makes the patient drowsy and languid. An exceedingly attenuated solution is capable of producing mydriasis and paralysis of the accommodation, and more quickly than atropine. The mydriasis passes off quicker, but the accommodation-paralysis does not do so. A solution of 1 : 500 or 1 : 1000 may be used safely, though its constitutional effects are thought to be less dangerous than atropine. It appears to have no effect upon the tension in chronic glaucoma, though sometimes improving vision somewhat. It is not indicated in acute glaucoma. Gley⁴¹ found that the effects of a single drop of a 1 per cent. solution lasted five days. *Scopoline* is recommended by Dunn⁴¹ as better than atropine, not as a mydriatic, but in keratitis, corneal ulcers, iritis, and especially in interstitial keratitis and rheumatic iritis. As a mydriatic it acts more promptly and energetically than atropine, according to Browne,⁴¹ and more durably. Nagai⁹³ is said to have discovered a new mydriatic alkaloid, *ephedrine*, in the plant *Ephedra-vulgaris helvetica*. From the experiments made by Minra¹⁸² it seems the drug has only weak mydriatic effects, a 10 per cent. solution being required to dilate the pupil partially, but leaving the accommodation untouched. There were no irritating effects from its use. The hopes aroused by the supposed discovery of a new mydriatic of serviceable peculiarities, named *stenocarpine* or *gleditschine*, were doomed to an early death by the discovery that it was a fraudulent compound of cocaine and some ingredient derived from the atropine group. Jackson¹⁰² gives the history of the matter. Galezowski¹⁶ says that a chemist (Calmeils) found that the cocaine used in the hospitals contained an alkaloid derived from *hygrine*, which is produced in the preparation of the cocoa-leaves, and that its powerful mydriatic qualities were completely subdued by eserine. Such a discovery seems too momentous to be chronicled only in the pair

of lines devoted to it by Galezowski. Borysiekciewicz⁹⁵ quotes Stellwag's objection to *cocaine*, that, however useful in the early part of cataract operations, it is a great disadvantage in expelling the lens on account of the diminished tension due to the general limpness of the muscles. For this reason, Borysiekciewicz has adopted the *glaskörperstich*, or incision of the posterior capsule, that the advancing vitreous may aid him in the extraction of capsular remains, etc. Jackson²⁵ learned, by experiments on himself and six others, that it requires fifty to sixty parts of cocaine to one of eserine to produce neutralization, though, strictly speaking, this does not exactly occur with any proportion. Cocaine gives wider mydriasis than the other mydriatics, and he notices that it produces irregular astigmatism and corneal irregularities; whence may have arisen the idea of its tendency to produce loss of the epithelial surface of the cornea. He has seen the corneal disturbance proceed to decided haziness, especially on exposure to the atmosphere. When cocaine is used in conjunctivitis there is a temporary relief, followed by an increased severity of the inflammation. The moral drawn is to apply no more than necessary, guard the cornea against exposure, and never put the drug in the hands of the patient for continuous use. A case is recorded⁹¹ of severe ulceration of the cornea following the frequent and persistent use of cocaine in conjunctivitis; and Carter⁵² had a case of epithelial denudation of a cocaineized eye during a cataract operation, without any bad result, however. He also had a case of acute suppuration of the lid from an injection of an aqueous solution of cocaine, which, as we know, soon becomes turbid. He therefore uses a saturated aqueous solution of salicylic acid as the solvent, the resulting liquid keeping bright and clear. In operation (*e. g.*, of squint) he uses wafers of cocaine instead of the solution, supplemented by injections. In operations on the lids he first marks the outlines of his incision in ink, so that the swelling resulting from the cocaine may not make the incisions misplaced. Bignall-Lima¹⁸³ uses a liquid vaseline 2: 200 for his cocaine solvent, because keeping better so. He also uses it hypodermatically. After incisions into the globe Galezowski¹⁶ uses thin gelatine tablets of cocaine and corrosive sublimate, slipped under the lid. He notices that the anæsthesia of cocaine comes on earlier, and is less durable in children than in the old, so that the dosage may be accordingly

regulated. In men it also comes on sooner, and does not last so long as in women. He uses injections for the excision of small tumors, cysts, chalazion, and in dilatation of the canal. In one case, however, of probing, he had toxic effects and ulcerations of the lid very obstinate to cure. Pardee¹⁰⁸ adopts Cocchi's suggestion, to use cocaine previous to testing intra-ocular tension, and then lay the fingers directly upon the globe without the disturbing (?) interposed lids. Stocquart¹⁰³ says that six to twelve drops of a 1 per cent. solution of apomorphine hydrochloride produces anæsthesia resembling that of cocaine, and lasts five to ten minutes. In view of reports that cocaine had, during operations, an evil influence, Collins²¹ quotes the results of loss in the London Hospital prior and subsequent to its use. With cocaine the percentages of loss from suppuration, loss of vitreous, and severe iritis, were, respectively, 1.13, 8.3, and 3.49. Without cocaine the corresponding figures were 6.2, 14.2, and 7.1. Mattison¹⁸⁴ has collected fifty instances happening during a year of the toxic effects of cocaine, some with fatal consequences. No case occurred in ophthalmic practice from simply dropping in the conjunctival sac.

92. *Antiseptics*.—Burnett³⁴ lost an eye from suppuration after the most thorough and rigid antiseptic precautions, and thinks that the final word as to the cause of suppuration yet remains unsaid. Carter⁵² uses boroglyceride in cataract operations, thoroughly irrigating the conjunctiva with a 20 per cent. solution before operating. Rampoldi⁶⁹ has never had any bad result from sublimate solution 1 : 2000, but uses it with great satisfaction in all operations on the eye. Maklakow¹⁸⁵ advocates peroxide of hydrogen as an antiseptic agent, especially in deep supplicative processes, since it penetrates quickly into the deepest and smallest fissures, and sets up a foaming action when it comes in contact with mucus or pus, rapidly cleansing the parts of all the products of suppuration.

Of the many summaries of the best methods of proceeding so as to secure antiseptic and aseptic operations upon the eyes, those of Carter,⁵² Rohmer,⁸⁵ Schumann,¹⁸⁶ Burnett,³⁴ etc., may be mentioned; but for practical and concise usefulness that of Weeks⁴³ is the best. We may note the dictum that, as a germicide, boric acid has little or no value, and trust that the superstition that it has such a value may not live forever. The general results of the experiments are confirmatory of the conclusions of previous investi-

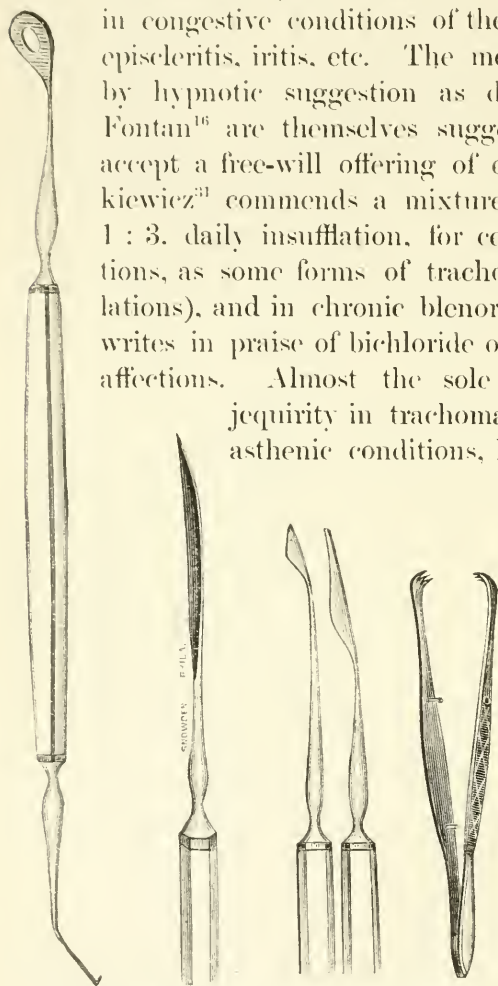
gation. Hot water is a sufficiently certain germicide for sterilizing polished steel instruments, and, as a rule, sublimate solution, 1 : 2000 to 1 : 5000, is the preferable antiseptic fluid for other purposes.

93. *Sundry Therapeutical Recommendations.*—The therapeutical applications of *electricity* have generally been indicated in considering the various diseases where writers have deemed the agent of service. Franke¹³⁷ is very enthusiastic as to the use of the thermo-cautery in granular trachoma, having had brilliant success in seven cases. In septic diseases of the cornea, as hypopyon keratitis and ulcer serpens, its application is also followed by the best results. He has noticed an exceptional clearing up of the cicatrices left by cautery. In pannus he was not successful in two cases in burning away a ring of vessels about the cornea, and in this he is therefore not able to confirm the results of Goldzieher, Fröhlich, and others. Mourrucau⁸⁶ has seen the best of results from the cautery in trachoma, and cites illustrative cases. Maufrais⁸⁶ adduces numerous uses of the thermo-cautery, and gives examples, drawn largely from the clinics of Meyer. Galezowski¹⁶ recommends the cautery in trichiasis and entropion, in ulcers and tumors of the cornea. Eulenberg²⁷ returns to his old contention, that episcleral application of the electrode is better than through the lids, in cases of paralysis of the external ocular muscles, and he urges the fallacy of the objection to it on the score of painfulness, now that we have cocaine. He uses a current of about one and a half milliampères, and has never seen irritative movements of the globe from such a current,—due, he considers, to the fact of the resistance of the globe (more aqueous) being two and a half times less than the muscle. Salterain¹⁶ has had good results in paralyses and spasms of the ocular muscles from the use of electricity, especially in the application of the Faradic current to spasmodic affections of the orbicularis. He also had success with a case of hysterical amaurosis. Standish⁵¹ has had good results with the constant current in the treatment of retinitis pigmentosa.

Dr. Connor¹² recommends the use of *hot water* in catarrhal and phlyctenular conjunctivitis and keratitis, in iritis, and in most external inflammations and painful processes. Dubois and Roux¹⁸⁷ find an opalescence of the cornea to result from the ingestion by dogs of chloride of ethylene. The corneal curve was also changed, the sensitiveness apparently not heightened. The tension was

slightly increased. The opacification was thought to be the result of a process of dehydration. Post¹² found *antipyrine* to have an analgesic effect, and now uses it in all painful cases of iritis. Dujardin¹⁰³ is also certain of excellent results in the use of antipyrine in keratitis, sarcomata, etc., as an analgesic. Vianu¹⁶ writes to extol the advantages of *medicated vapors* in ocular therapeutics. He thus uses phenic acid, cupric sulphate, boric acid, iodide of potassium, etc. Three cases are given. Paddock²⁷ praises the action of *ergotin*

in congestive conditions of the eye, such as conjunctivitis, episcleritis, iritis, etc. The methods of ocular therapeutics by hypnotic suggestion as described, for example, by Fontan¹⁶ are themselves suggestive. Why will they not accept a free-will offering of our "faith cure"? Wicherkiewicz²¹ commends a mixture of tannic and gallic acids 1 : 3, daily insufflation, for certain external ocular affections, as some forms of trachoma (softened, pasty granulations), and in chronic blenorrhœal conjunctivitis. Alt¹⁸⁸ writes in praise of bichloride of mercury in external ocular affections. Almost the sole voice raised in behalf of jequirity in trachoma is that of Smith,²⁷ who, in asthenic conditions, has had good results from a light grade of induced inflammation.



SCHMIDT-RIMPLER'S LENS-SCOOP. CYSTITOME.
CUTTING-SPOON AND SCARIFIER.—(Monatz.
Polytech. Aertz.)

MECHANICAL AIDS.

94. *Surgical Instruments*.—Schmidt-Rimpler¹⁸¹ finds four new instruments praiseworthy additions to his armamentarium. The first is a lens-scoop, with cystitome, adapted to use in case the lens luxates while pressure is being made upon the cornea. There are also a cutting

spoon for chalazion operations, a tear-sac scarifier, and a strong forceps for grasping the globe in enucleation. Cuts are shown herewith.

The instrument devised by Briggs⁴³ for performing optico-ciliary neurotomy consists of a double pair of curved scissors so arranged that the nerve is divided in two places, and the excised piece of the same is brought away between the blades. Browne⁴¹

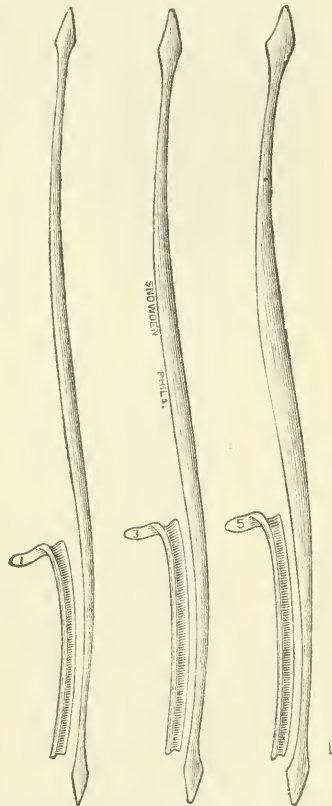


BRIGGS' NEUROTOME.—(*Archives of Ophthalm.*)

has devised a strabismus-hook, hollow, with perforated point, and with a small rubber globe at the other end. The plan is to bring the anæsthetic in direct relation with the sub-conjunctival tissues that are to be divided. The above figure shows the design.



Dale shows a new style for facilitating the treatment of stricture of the lachrymal duct. While the probe is in place, the style may be slipped along the probe through the stricture, and left *in situ*. There is claimed greater facility of introduction, more rapid dilation, and more perfect drainage. See annexed figures.

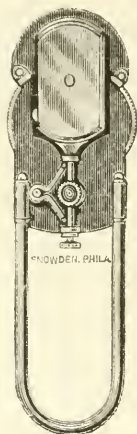
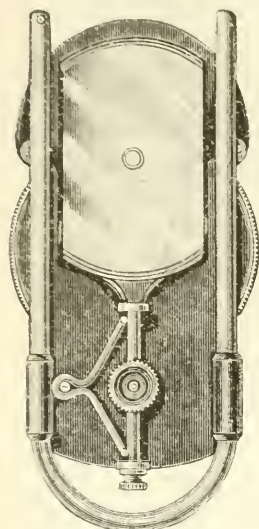


DALE'S STYLE AND PROBE.—
(*Edinburgh Med. Sum.*)

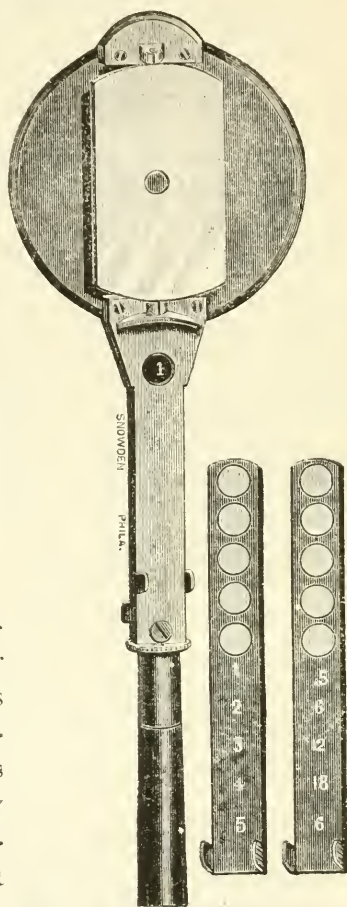
Theobald¹² prefers a probe made of aluminium, because lighter, and having "a peculiar slipping quality." Prince has devised an ingenious method of having the thread enclosed in the handle of an advancement-needle, so that the thread is kept free from contact with everything, and is out of the way. For episcleral faradization and galvanization Eulenberg²⁷ advises a special electrode, devised by Hirschman, of Berlin.

95. *Ophthalmoscopes*.—Jessop's ophthalmoscope,⁴¹ was designed as a cheap, efficient, durable, portable, and simple instrument for students and practitioners (see figures). Its telescopic handle, etc., enables it to be carried in an oval spectacle-case in the waistcoat-pocket. There are eleven lenses, comprising plus 1. D., 2. 3. 4. 9, and 20, with minus 1. 2. 3. 4, and 6.

FULL SIZE.

JESSOP'S OPHTHALMOSCOPES.—(*British Med. Journal*.)

For the purpose of making drawings of the fundus oculi, and in order to have the hands free, Adams¹⁸⁹ has arranged an attachment of an ophthalmoscope to a head-band, so that it is held in position like the mirror used by aurists. Jackson,² to avoid the disadvantages of the disk, with the weight and complications of the ordinary ophthalmoscopes, has placed the lens in two slides, as shown in the above cut, and fully explained in the author's description.

JACKSON'S OPHTHALMOSCOPES.—(*Ophthalmic Review*.)

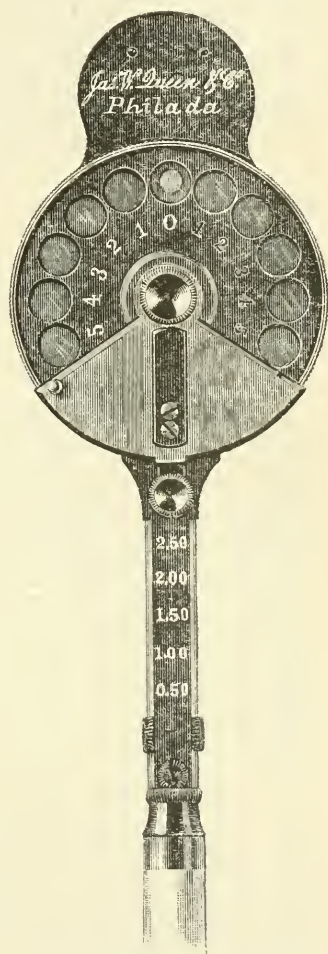
Dr. Burnett⁵¹ exhibits an ophthalmoscope with a clip on the back to hold the cylindrical lenses of the trial-case, and a graduation around the edge of the mirror-plate to show the direction of the cylinder-axis.

Risley⁵¹ has devised an instrument with cylindrical lenses. It is a modified Loring, with slides similar to Jackson's, but the slides contain convex cylindrical lenses, with axes parallel to the stem of the instrument. The change of axis is gained by varying the handle from the perpendicular. The general design of the instrument is shown herewith.

Dr. Howe² showed "an ophthalmoscope, with a good lens-disk, which packed into the compass of a small pill-box." Demmett² has devised an electric-light attachment or handle with a cheap battery. The light thus gained is better and more manageable than the ordinary lamp, etc.

In response to the objections of large size, expensiveness, etc., made against the instrument of Knapp, Keyser⁴⁹ has completed an instrument that obviates these, and with which all changes in the glasses may be made during the observation without taking it from the eye. It contains an outfit of concave and convex spherical lenses up to 16 D. The two cuts on the right give a representation of this serviceable instrument.

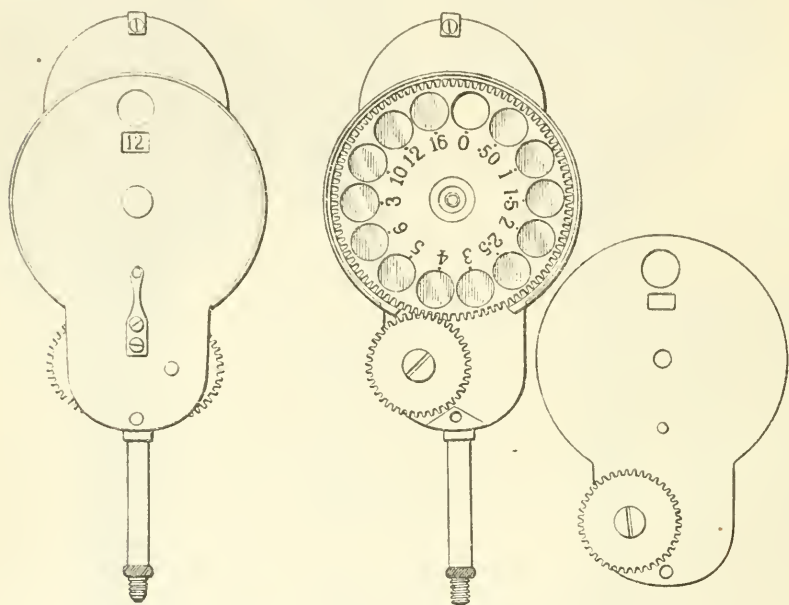
96. *Optometers*.—Chisolm¹⁰² has designed a method whereby the family physician who is not versed with the details of ophthalmic science may decide whether the visual defect of a patient be due to an error of refraction or to some more serious lesion requiring a special grade of technical skill. It is simply a kind of "Tweedy," made by taking two-thirds of an ordinary yard-stick, to which is attached a ten-inch focal lens. A card containing type-letters in different sizes slides upon the stick. If no point of the optometer is clear, glaucoma, cataract, etc., may be suspected, and "the physician protects his reputation



RISLEY'S OPHTHALMOSCOPE.—
(Trans. Am. Ophthal. Soc.)

and saves the eyesight of his patient." For the same purpose, Dr. Wolffberg's method¹¹ is thus described by the *British Medical Journal*:—

It consists in instituting a comparison between the patient's power of distinguishing form (as tested by Snellen's distance-types) and his color perception, as shown by the distance at which he can see a red and a green disk on a black ground. An error of refraction will have the greatest effect upon the form perception, and a defect in the light sense of the color vision. From an examination of a large number of ametropes, in whom correction gave normal

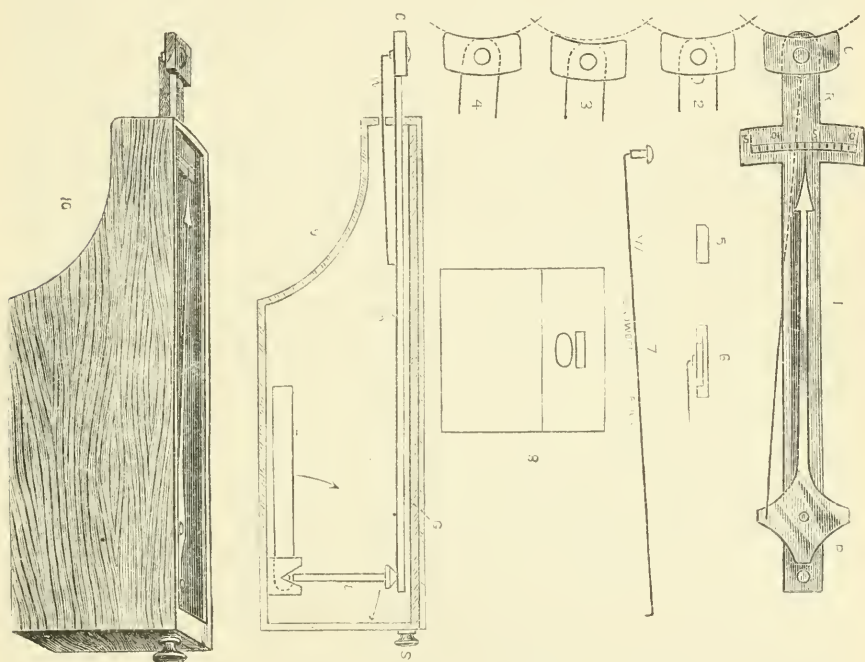


KEYSER'S OPHTHALMOSCOPE.—(*Phila. Med. Times.*)

vision, and of emmetropes rendered ametropic by spherical lenses, Dr. Wolffberg has constructed a table showing the distance at which the disks should be visible in each grade of impaired vision, when the impairment is solely due to an error of refraction; when the conditions correspond with the table, it may be concluded that correction of the ametropia by spherical lenses will give normal vision. Astigmatism causes a greater impairment of the form perception without a corresponding effect on the color perception; hence its presence is shown by the colored disks being visible at a greater distance than corresponds with the vision. A diminution

in the distance at which the disks are visible shows, on the contrary, that the light sense is impaired, and that normal vision will not be obtained by the correction of any error of refraction that may coexist.

Tscherning⁴⁵ presents a simplification of the ophthalmometer of Javal, in which the duplication of the image is obtained by a divided objective. Its cost is one-third or one-fourth that of the Javal instrument. Bull⁴⁶ showed the congress of French ophthalmologists an instrument designed to measure approximately the



PRIESTLEY SMITH'S TONOMETER.

refraction and amplitude of accommodation with great rapidity. Holden's device⁴³ aims to test refraction and its errors, the strength of the recti-muscles, and their insufficiency by a very simple mechanism, a modification of Scheiner's experiment, consisting of a rotatory cylinder (+ or —) before a disk with two small perforations, placed horizontally while the patient looks through them with one eye at a light six millimetres distant. The application is ingenious, and it is to be hoped it may prove a labor-saving plan for "the hard-worked refractionist."

97. *Miscellaneous.*—The *tonometer* of Priestly Smith for measuring the degree of intra-ocular pressure commands respect, from an endeavor to render as accurate as possible those estimates that, under the best circumstances, are unfortunately but too indefinite and doubtful. Into a detailed description we cannot go, but a general idea of the instrument can be gathered from the reproduction of the illustration herewith. The crescent, C, is hollowed to fit the convexity of the globe, is slightly rotatory, and when pressed against the eye slides back and communicates its motion to the pointer, which registers the depth of the pit made in the eye by the ram, R, in tenths of a millimetre. Dentz, in his inaugural dissertation (Utrecht) describes an improved *strabismometer* that is praised²⁷ as being simple, ingenious, and accurate. Holden¹³ describes an instrument he has devised for testing *insufficiencies of the recti muscles* that seems excellently well-adapted to the purpose, and has the advantage of simplicity. Gould¹² presents a model for the use of teachers in illustrating the essential conditions of emmetropia and ametropia. Purves⁴¹ has found the use of a large concave mirror of about eight inches focus, placed upon the brow, to be serviceable in ophthalmic operations when done under disadvantages of bad light. Ametropic correcting glasses may be used in connection if desired. Anderson⁷ uses a small oval *wire speculum* outside the lids, in removing a foreign body, and in such small operations. Under this pressure the eyelids cannot be closed, the globe is fixed, the cornea tensed, and the discomfort of a speculum under the lids is avoided. Wicherkiewicz,¹⁹⁰ to avoid the dark room, has advised cup-shaped *eye-cells* of porcelain, enameled black without and within, ventilated, etc. When tied over the eye no light can enter, and the patient may have exercise, or the room may be as light as others desire. Wolffberg advises a peculiar kind of *dressing* made of "hydrophilous paper," that, when moistened, may be moulded to any shape desired, and soon dries about the eye so as to make a safeguard against external infection, and a protection at the same time from injury. It may be kept limp over the lids by moistening, if so desired. Jackson⁵¹ exhibits a set of *test lenses* only one inch in diameter, thus effecting a saving of one-half in weight of lenses and frame. They are made plano-convex and concave, thus lessening spherical aberration, making it easier to combine them, etc. Oldham⁴¹ finds that

his patients have greater comfort and ease by arranging their glasses *à double foyer* (more properly, their Franklin glasses), so made that the lower or reading glass forms an obtuse angle with the upper, which last is, of course, vertical. The advantage is certainly evident; but to thus grind the two glasses in one solid piece, as we do here (and which is, of course, far better both for the patient's sake and for his friends' sakes), would be a difficult problem for the optician to solve. Simmons¹⁰⁰ relates how Chinese mother-wit conquered the conjunctivitis that was produced by the heat of the cooking stove. Collyriæ of astringents were only temporarily useful; but the crude *spectacles of mica*, transparent, non-magnifying and non-heating, gave permanent protection from the cause of the mischief. Haab's *sketch-book*¹² is designed as a labor-saving device and an aid to accurate representation of the fundus oculi. An erasable red background enables one, by the aid of a lead-pencil and a couple of crayons, to reproduce a picture, both in color and form, of what he sees by the aid of the ophthalmoscope. At a recent meeting of the Sei I Kwai, or Society for the Advancement of Medical Science in Japan, Dr. Whitney explained a method used by him, of *recording measurements of the refraction and accommodation of the eye*. We regret that we cannot describe the excellent plan kindly sent. Those who may have any influence in banishing the old-fashioned torture desks of school-children, and in substituting something better, something that shall also conform to the demands of ophthalmic prophylaxis, may profitably consider Schenck's plan for a *new school-desk*.¹⁴⁶

UNCLASSIFIED.

98. *Statistical*.—The statistical study of Magnus concerning the causes of blindness in the young of Europe is a work deserving the highest praise. He has gathered, with true German patience and thoroughness, the data of 3204 blind people under twenty years of age, and presents his results in a literary and diagrammatic form, leaving nothing to be desired except, so far as we are concerned, space to reproduce here, *in extenso*, the conclusions he reaches. Of the 3204, 2009 are males, 1195 females, furnished by the following countries, in the proportions given: Belgium, 124; Germany, 1595; Holland, 115; Italy, 260; Austria-Hungary, 508; Russia, 142; Switzerland, 73; Spain, 129. The variations in the

numbers ascribed to the different causes in these countries is instructive. Taking the averages, the most prolific source is, of course, ophthalmia neonatorum; and it is gratifying to get this intimation,—that the former estimates that have been made are, under the benign influence of antiseptics, being gradually reduced. The number is still frightful enough, however, when it is considered that the evil is easily and wholly preventible. Of congenitally blind there are 551 cases, or 17 per cent. of the whole number. Among these the percentages of the causes are given as follows: Anophthalmos, 0.30; microphthalmos, 2.14; buphthalmos, 1.29; optic atrophy, 3.09; retinitis pigmentosa, 1.99; atrophy of the retina, 0.59; choroiditis and chorio-retinitis, 0.60; congenital cataract, 3.88. Idiopathic diseases are charged with 1060 cases, or 33 per cent. of the whole number. Under this head, ophthalmia neonatorum has 20.66 per cent; gonorrhœal ophthalmia, 0.70; trachoma, 1.34; diphtheria of the conjunctiva, 0.25; other conjunctival troubles, 1.00; keratitis, 0.55; irido-choroiditis, 2.04; choroiditis, 0.40; detachment of the retina, 0.90; glioma, 0.05; optic atrophy, 2.69; glaucoma, 0.19. Two hundred and sixty-one cases, or 8.15 per cent. of all, are due to injuries, distributed as follows: Injury of the eyes, 3.13 per cent; of the head, 1.24; operations, 0.19; sympathetic, 5.47. One thousand and sixty-three cases, or one-third of all, are due to general diseases, shared as follows: Scrofulous, 7.07; syphilis, 1.14; cerebral and meningeal, 9.96; measles, 3.63; scarlatina, 2.98; variola, 7.02; other exanthemata, 0.45; typhus, 1.00. Causes are unknown in 269 cases, or 8.36 per cent. Howe⁵¹ notices that from 1870 to 1880 the population of the United States increased 30 per cent. and blindness over 140 per cent. It was found to increase from north to south, and to decrease from east to west. Noyes² thought this was due to mining and mill accidents, and the failure in many such regions to secure skilled medical aid. According to Corradi there are 76.3 blind to 100,000 inhabitants in Italy. From Kubli's report of five years of a St. Petersburg institution,⁷ we find that there were treated 23,286 adults during this time, of which 10,000 were conjunctival affections, 5000 corneal, 213 were cases of glaucoma, and 449 of lens troubles. Steffan⁶⁸ concludes that among the poor of Germany there is yet a great ophthalmic work to be done, since 40 per cent. of all blind are needlessly so. In Prussia alone there are some 9000 blind.

In 1882 he concluded that there were in Germany 15,053 blind that, with proper prophylactic treatment, might have retained their vision.

From Ricker's report²⁷ of the St. Petersburg Ophthalmic Institution we learn that conjunctival affections formed (1883-1884) nearly one-third of all, and that of these trachoma formed 21 per cent. Corneal affections coincide largely in numbers with the months of greatest weather changes. There were 3200 (10 per cent.) cases of injury. In Cuba, Lopez¹⁶ finds the different races are affected with ocular troubles in the following proportions: Taking the whites as normal or 1.00, the Chinese are 1.42; the blacks, 0.64; the mulattos, 0.74. Among the whites, affections of the conjunctiva, sclerotic, retina, vitreous, crystalline, and motor muscles predominate. Among the Chinese, the affections of the cornea are exceptionally numerous, so much so that operations on this membrane are very hazardous, from its tendency to suppurate and break down. Among the mulattos, neuralgias of the trigeminus and amblyopias are very frequent, whilst maladies of the lachrymal apparatus and the deep membranes are exceedingly rare. Among the blacks the most common troubles are diseases of the choroid and optic nerve. Cataracts are about as often met with as among the whites. All races are about equally subject to iritis. His statistics are based upon 622 cases. Tiffany¹²⁹ finds 22.4 per cent. of the school-children of Kansas City have some anomaly of refraction or accommodation, and that "the far-seeing eye of the red man is bedimmed by syphilization in the effort of civilization." He also thinks hazel eyes most liable, and light eyes less liable, to be ametropic.

REFERENCES.

1. Quar. Jour. Mic. Sci. 2. Op. Rev. 3. Neurol. Centralbl. 4. Berl. Klin. Wochenschr. 5. Jour. Nerv. and Men. Dis. 6. Wien. Med. Jahrb. 7. Lancet. 8. Arch. f. Physiol. 9. Motais, Anatomie, etc., Paris. 10. Ferrier, Functions Brain, 2d ed. 11. Jour. Nerv. and Men. Dis. 12. Am. Jour. Op. 15. Untersuch., etc., Vienna. 16. Rec. d'Op. 17. Luminous Intensity, etc., Soc. Biol. 18. Graefe's Archiv. 19. Arch. f. Angenhk. 21. R. L. Op. Hos. Rep. 22. Canad. Practitioner. 23. La Normandie Méd. 25. Med. News. 26. Centralbl. f. d. Med. Wissensch. 27. Centralbl. f. prak. Angenhk. 28. Vrach. 29. Die Iris, etc., Tübingen. 30. Arch. f. d. ges. Physiol. 31. Annal. d'Oc. 32. N. Y. Med. Jour. 33. Med. Press and Cir. 34. Jour. Am. Med. Ass. 35. Arch. p. l. Sci. Mediche. 36. Weekly Med. Rev. 37. l'Union Méd. 38. Lond. Med. Rec. 39. West. Med. Rep. 40. Viertelj. Dermatol. n. Syph. 41. Brit. Med. Jour. 42. Wjestnik Op. 43. Arch. Op. 44. Edinb. Med. Sum. 45. Bull. d'Oc. 46. Rev. gén. d'Op. 47. Hygeia. 48. Practitioner

(*Lond.*). 49. *Phil. Med. Times.* 50. *Jour. Am. Med. Ass.* 51. *Transac. Am. Op. Soc.* 52. *Med. Press.* 53. *Prov. Med. Jour.* 54. *Med. and Surg. Rep.* 55. *Prog. Méd.* 56. *Annal. d. gyn. et d'Obstet.* 57. *Deutsch. Med. Zeit.* 58. *N. O. Med. and Surg. Jour.* 59. *Wittelsh. Wien. Med. Woch.* 60. *Med. Stand.* 61. *Monatsschr. f. Augenhk.* 62. *Glasgow Med. Jour.* 63. *Jour. de Méd., de Bord.* 64. *Bull. d. l. Soc. franç d'Op.* 65. *Atlanta Med. and Surg. Jour.* 66. *Am. Lancet.* 67. *Med. Regis.* 68. *Klinisch. Monatsbl.* 69. *Annali di Ottal.* 70. *Il Morgagni.* 71. *Reich. Ueber Trachom, Tiflis.* 72. *l'Union Méd.* 73. *Giorn. d. Re. Accad.* 74. *La Sem. Méd.* 75. *Rev. d'Hygiène.* 76. *Annal. de Dermatol. et Syph.* 77. *Gaz. des Hôp.* 78. *Wjestnik. Op.* 79. *Kans. Cit. Med. Rec.* 80. *St. Louis Wk. Med. Rev.* 81. *Deutsch. Med. Zeit.* 82. *Jour. Am. Med. Ass.* 83. *Gaillard's Med. Jour.* 84. *Bock, Zur Kenntniss, etc., Vienna.* 85. *Arch d'Op.* 86. *Thèse de Paris.* 87. *Pincus, Beitrag, etc., Königsb.* 88. *Operazione, etc., Torino, 1883.* 89. *Hayem's Rev. d. Sci. Méd.* 90. *The Sei-i-Kwai Med. Jour.* 91. *Am. Jour. Med. Sci.* 92. *Texas Cour.-Rec.* 93. *Wien. Med. Press.* 94. *Rev. Clin. d'Oc.* 95. *Wien. Med. Woch.* 96. *Jour. de Méd.* 97. *Rev. de Thérap.* 98. *Comm. à l'Acad., etc.* 99. *Pacif. Rec.* 100. *Bos. Med. and Surg. Jour.* 101. *Rev. Méd. Toulouse.* 102. *Md. Med. Jour.* 103. *Jour. Sci. Lille.* 104. *Norweg. Jour. Med. Sci.* 105. *Med. Chron.* 106. *Cin. Lancet-Clin.* 107. *Wien. Klin.* 108. *Pac. Med. and Surg. Jour.* 109. *Bristol Med. and Chir. Jour.* 110. *Atlanta Med. and Surg. Jour.* 111. *Kansas Cit. Med. Index.* 112. *Trans. Am. Op. Soc.* 113. *Inaug. Diss.* 114. *Neuritis Op., Jena.* 115. *Provinc. Med. Jour.* 116. *Lyon. Méd.* 117. *Tex. St. Med. Soc.* 118. *Hospitalstidende.* 119. *Ind. Med. Gaz.* 120. *Pharmaceut. Rec.* 121. *Revist. Cien. Med. Barcelona.* 122. *Detroit Acad. Med.* 123. *Miss. Val. Med. Mo.* 124. *Canada Med. Rec.* 125. *Berger, Zur Kenntniss, etc., Wiesbaden.* 126. *Rev. Clin. d'Oc.* 127. *Berger, Zur Feirage, etc., Wiesbaden.* 128. *Chicago Jour.* 129. *Kansas Cit. Med. Index.* 130. *Tex. St. Med. Ass.* 131. *St. Louis Med. and Surg. Jour.* 132. *Inaug. Diss.* 133. *Zeitschr. Klin. Med.* 134. *South. Med. Rec.* 135. *Nature.* 136. *Color-blindness, etc., Melbourne.* 137. *Deutsch. Med. Woch.* 138. *Rev. Méd. Suisse Rom.* 139. *Allgem. Med. Central Zt.* 140. *Liverpool Med. Jour.* 141. *Fortschr. d. Med.* 142. *Jour. de Méd. et Chir.* 143. *Traité Complet.* 144. *Bull. Clin., etc.* 145. *Ein Beitrag, etc., Wiesbaden.* 146. *Correspondenzbl. Schweiz. Aertz.* 147. *Albany Med. Annals.* 148. *Ala. Med. and Surg. Jour.* 149. *Arch. Mens. Méd. et Chir.* 150. *Ft. Wayne Jour. Med. Sci.* 151. *Gaz. Hebdom. Bord.* 152. *Zeitschr. Ohrenhk.* 153. *Am. System Dentistry.* 154. *Provinc. Med. Jour.* 155. *Inaug. Diss. St. Petersb.* 156. *Chicago Med. Stand.* 157. *Med. and Surg. Rep.* 158. *Arch. f. Psych.* 159. *La Trib. Méd.* 160. *Neurol. Centralbl.* 161. *Arch. Pschyat.* 162. *Neurol. Centralbl.* 163. *Edinb. Med. Jour.* 164. *Brain.* 165. *Ind. Med. Gaz.* 166. *Rév. d. Méd.* 167. *Präger Méd. Woch.* 168. *St. Petersb. Med. Woch.* 169. *Functional Nerv. Dis.* 170. *Albany Med. Annals.* 171. *Pittsb. Med. Rev.* 172. *N. Y. Med. Mo.* 173. *West. Med. Rep.* 174. *Berl. Klin. Woch.* 175. *Bull. Méd. des Vosges.* 176. *Poly-clinic.* 177. *Wortblindheit, etc.* 178. *Die Seelenblind, etc.* 179. *Untersuch, etc.* 180. *Am. Prac. and News.* 181. *Theoret. and Prac. Treatise, etc.* 182. *Therap. Gaz.* 183. *Bull. Gén. de Thérap.* 184. *Chicago Med. Jour. and Ex.* 185. *Russkaya Med.* 186. *Antisepsis, etc., Berlin.* 187. *La France Méd.* 188. *St. Louis Med. Rev.* 189. *Ill. Monat. Polytech. Aertz.* 190. *Lond. Med. Rec.* 191. *Die Jugendblindheit, etc., Wiesbaden.* 192. *Die Netzhautablösung, etc., Wiesbaden.*

[Undated references apply to journals published in 1887, and original articles can be found by consulting the indexes of the respective publications.]

OTOLOGY.

By CHAS. S. TURNBULL, M.D., PH.D.,

PHILADELPHIA,

AND

CHAS. L. WEED, A.M., M.D.,

PHILADELPHIA.

THE progress of Otology during the past year has fully equalled that of any other special branch of medicine or surgery, and it has been no light task to do justice to the instructive material presented. The double task of collecting the contributions of the year and of showing their relation to the current has been rendered impossible by the limited space allotted to Otology. We have therefore for the first year of the ANNUAL been compelled to select certain topics only for exhaustive treatment, and in the case of others to content ourselves with the simple report of undigested data.

The laboratory has given a quantitative value to the observations of the clinic, and instruments of precision are becoming authoritative in settling questions of prognosis and treatment.

The marked attention which medical men are now giving the study of aural disease, its position in some of the academic curricula, and the stress laid upon it in some of the leading schools at their final examinations, are causes for congratulation and give rise to the hope that in the near future less maltreatment and abuse of the organ of hearing will be permitted than the last decade has condoned. And we already claim that although as elsewhere in medicine our diagnosis must too often be made by exclusion, and granting that chronic plastic otitis and tinnitus-aurium—to say nothing of otitis interna, as difficult to treat as the name of its bony envelope would imply—remain our opprobria, nevertheless each year shows fewer cases of deafness.

RINNÉ'S TEST.

The sharp criticism to which Rinné's experiment has been subjected does not seem to militate against its value, but tends to

define the interpretation which it will warrant. In dealing with quantities, which (even when the auditory function remains constant) vary as widely with the conditions of the experiment as do air-conduction and bone-conduction, it is essential that the conditions be maintained unaltered throughout.

As respects air-conduction, Barth¹ summarizes as follows: In examining the same healthy or diseased person by bells, tuning-forks, etc., concordant results are obtained. The available measure of the vibration is its duration. It is immaterial whether the vibrations decrease in a geometrical or in an arithmetical ratio, and variations in the logarithmical decrement may be disregarded. The essentials are that the vibrations be equal in intensity and duration. He proposes an isosceles triangle, with initial amplitude, indicated by the base and duration by the altitude, as a graphic representation of vibrations of any sort, and decreasing in any proportion. With the initial amplitude constant, all amplitudes are directly proportioned to durations, whether the fork sounds quickly or slowly. If the intensity is a mathematical function of the amplitude, and if the amplitude decreases in regular progression, decrease of intensity is proportioned to that of amplitude. The rapidity of decrease in intensity is without import, if the initial intensities are equal; with equal fractions of the duration, the intensity will be constant.

Of course the intensity of the vibration varies inversely with a function of the distance of its source; but as our perceptive power does not bear any similar relation to the intensity of the sound, the audible durations of a regularly decreasing tone are not functions of the distance; or, more correctly, the mathematical relationship is as yet undetermined. Eitelberg² has found by experiment that within an average limit of one metre from the ear there is a sort of inverse proportion between the distance and audible duration; that, however, between the limits of 1 and 6 metres there is a surprising identity of perceived durations. The disturbing element in the calculation is probably the inertia of the hearing apparatus, and the practical lesson is that tests should be made within the 1-metre limit.

As to direction of sound we are not, in the case of tuning-forks, possessed of sufficient data to warrant any generalization; but *à priori* we might expect a parallelism between tuning-forks

and the watch in the matter of the influence of direction upon the duration of the sound. Important observations upon the latter have been made by Eitelberg.² His notes, which are too extended for reproduction here, tend to show that maximum audition is in a prolongation of the axis of the meatus, and that it decreases in some way proportionately with the angle of deflection from this axis. Furthermore, that in the axis of either meatus it is immaterial whether one or both ears be in use; that, however, as the watch approaches the median plane, the other ear comes in to reinforce audition. If, then, there is parallelism between the watch and tuning-fork in the influence of direction upon the hearing distances, we might *à priori* expect that within the 1-metre limit direction might also bear some definite relation to the duration of the sound. Clinically this variable element can be eliminated by testing always in the cardinal auditory axis,—that is, in a prolongation of that of the external meatus.

As in the case of air-conduction, so in that of bone-conduction there has been an effort to more precisely define its quantitative value; and here, too, is Otology much indebted to Eitelberg.² As to intensity, a young musician with normal hearing “was willing to vouch for the following order of loudness: Teeth, mastoid process, tragus (near), mastoid process (farther from the attachment of the auricle), occiput; then forehead, temple, and parietal bone, which were said to be equivalent, and finally the vertex.” Another patient of Eitelberg, with bilateral catarrh of the middle ear, found the tuning-fork unendurable upon the mastoid (near), but otherwise the order of apparent loudness fitted the paradigm above. The case, moreover, was remarkable for the phenomenon of crossed perception which it exhibited, and which would have made the attempt to reach a diagnosis by bone-conduction alone very interesting. The forks were heard from the teeth and occiput equally well on both sides; from vertex and forehead, better on the right; from each mastoid and in front of the tragus, well on the corresponding side, faintly on the opposite; but from the temple and parietal bone, *only* on the opposite side. It may be added that the watch was heard equally well in both ears, from the vertex, forehead, teeth, and occiput (the latter but faintly); and only upon the corresponding side from the temple, parietal bone, mastoid process, and in front of the tragus.

As to duration of sound by bone-conduction, Eitelberg¹ records a case which will serve as a paradigm for normal hearing. The duration of the sound by air-conduction (directly in front of each tragus) being 58 seconds, he found that by bone-conduction it was 35 seconds from in front of the right tragus; 28 to 32 in front of the left; 30 from each mastoid near the auricle; 24 from the right mastoid farther from the attachment to the auricle; 22 from the corresponding position on the left side; from the temples, 17 on the right and 15 on the left; 14 from each parietal bone; from the forehead, 18 seconds; 16 from the root of the nose; 20 from the occiput; and 15 from the teeth. It will be noticed that this normal order of duration bears no definite relation to the normal order of loudness before quoted.

A source of error in Rinne's experiment now becomes apparent, namely, variation in duration with that in position. If, for example, the above individual should suffer a diminution by air-conduction to 20 seconds, the result of the experiment would be positive from the parietal bone and negative from the mastoid process, and no conclusion could be reached. To repeat the test in every part of the skull would furnish a mass of data too unwieldy for clinical utilization. Hartmann³ confines the experiment to the mastoid, and excludes from it those cases in which this limitation would be a source of error by the empirical rule of Lucae,—to apply Rinne's test only when the limit of whispering distance is less than 1 metre.

Another condition of the experiment, or a source of error if it be not regarded, is the pitch of the instrument used. Bone-conduction may predominate with high tones, and air-conduction with low tones, and *vice versâ*. This, so far from impeaching the value of the test, is no more than we might expect. If, for example, in addition to an error in conduction there be a weakening in some portion of the labyrinthine scale, and a pure-toned fork of a corresponding pitch be used, the experiment will give a positive result; if of any other pitch, a negative one. With the use of a single fork, as is common in practice, it is impossible to eliminate error from these auditory scotomata. Eitelberg tests with a^1 , c^2 , and f^2 -sharp, securing three altogether different sets of overtones. Hartmann was accustomed formerly to use six forks,—A (106.6), c^1 (256) of low pitch; c^2 (512), g^2 (768) in the middle register; and

c⁴ (2048) and g⁴ (3072) of a high pitch,—but has abandoned this series for four octaves of c (128–2048). The discrepancy in result between the tests, as applied with instruments which make a noise, of which the watch is a type, and with those which produce musical tones of comparative purity, like the tuning-fork, may not be altogether independent of this question of overtones covering scotomata, which would otherwise lead us astray. We cannot yet dispense with the watch as an acumeter.

Bezold⁴ has made the further discovery that in case of low-pitched tones audition by air-conduction can in the normal ear be made to disappear and reappear respectively by the negative and positive Valsalvian experiments, while in the case of tones of higher pitch this is not true; whence he infers that the sound-conducting apparatus conveys only those waves of sound for the lower portion of the scale which strike the ear by aerial conduction. For the upper part of the scale it is superfluous. If, then, there be an error in conduction, we may expect a loss of the perception of tones lower in the scale by air-conduction.

Finally, contra-audition (*Hinüberhören*), by which is meant bone-conduction from the mastoid process to the ear of the opposite side, becomes a factor in the problem. Already in 1886 Politzer⁵ referred to it as a source of error, and proposed to avoid it by placing the stem of the fork parallel to the longitudinal axis of the mastoid process. By this means he eliminated contra-audition in the majority of cases, but in certain he did not. On the other hand, a perpendicular position of the stem to the mastoid axis would generally develop the contra-audition.

Inasmuch as this phenomenon must rest upon physical laws, Baumgarten⁶ has sought to give it a diagnostic and prognostic value. The conditions favorable to its production are the selection of the portion of the mastoid usually chosen for trephining, a position of the fork perpendicular to the axis of the process, and a high pitch of the tone, exceeding 1000 vibrations per second. Baumgarten's experiment is as follows: If in a case of normal hearing one meatus be closed with cotton, and the fork be placed as above on the other side, the sound will be heard in the stopped ear. If in like manner the other ear be stopped, contra-audition will not take place. If instead of cotton the finger firmly applied be used to close the ear, the phenomenon will be still more pronounced.

Whenever there is an obstacle in one of the auditory canals to the passage of sound a fork placed upon the skull will, as is well known, be generally perceived upon that side, but such may not exclude a coexisting serious malady of the middle ear. However, according to Baumgarten, if in a like instance a fork be placed in the typical manner upon the mastoid of the opposite side, and there be a contra-audition which ceases upon firmly closing the unaffected ear with the finger, we are warranted in the conclusion that there is no grave disorder of the tympanum. To hermetically close the canal the patient may be directed to use his little finger, having first moistened it. Prognostically, Baumgarten considers all cases favorable in which the phenomenon of contra-audition can be first elicited by this typical procedure and be made to disappear in the manner described. They are unfavorable when it persists.

To recapitulate, although in a different order, the crusade against Rinné's test has resulted in imposing for clinical use the following limitations:—

1. Only those are fit subjects whose hearing distance for whispered speech is less than 1 metre.
2. Air-conduction should be tested in a prolongation of the axis of the meatus, always from the same distance,—never exceeding 1 metre, and preferably from a point as near the tragus as possible.
3. Bone-conduction should be tested from that part of the mastoid where it is the custom to trephine, the stem of the fork being placed parallel to a prolongation of the long axis of the process, and that upon the affected side. In case of the Baumgarten experiment, the opposite mastoid is selected and the axis of the instrument is made perpendicular to that of the process.
4. Various forks should be used, ranging from 100 to 3000 vibrations per second.

If these limitations be regarded, it remains to be seen whether any laws of coexistence can be established between tissue-change and sound-conduction. If they be not regarded, the conclusion of Politzer, Schwabach, and Eitelberg is inevitable: that the Rinné experiment has by no means the differential diagnostic value that has been claimed for it; and even if the value of the test should be established, the proposition of Eitelberg would still hold good: that no one method of examination thus far in use can alone decide

the question whether the sound conducting or perceiving apparatus is chiefly or exclusively affected; and that we can form a correct idea of the case under consideration only after the most careful estimation of all the particulars obtained from the history and tests.²

We have been engaged thus far chiefly in a criticism which has been destructive in its aim to certain invalid generalizations, and by accounting for concomitant variations has served to eliminate apparent contradiction in the products of the induction. With the ground thus cleared, it remains to show what has been done toward rebuilding. As yet no general law has been formulated, but in certain separate groups of aural disease the relation of sound-conduction to tissue-change has been demonstrated. Very briefly, the principal investigators have placed the following material at our disposal:—

Schwabach,⁷ after showing that neither Rinné's experiment, nor the same as restricted by Lucae; nor the comparison of the perceived duration of bone-conduction from the vertex in the case of disease with that in normal hearing, alone suffices to differentiate between error in conduction and error in sound-perception; and that of all three the test as originally performed by Rinné gives the least, while the duration-test from the vertex gives the most, guiding points in diagnosis, concludes:—

1. We may assume a nervous affection if, in the absence of objective symptoms, Rinné's test gives a positive result.

2. Lucae's limitation will render a like inference valid in certain groups of cases, even when there are objective symptoms.

3. A negative Rinné, in the presence of objective symptoms, leaves the condition of the nerve doubtful; but the duration-test from the vertex will render valuable aid in the diagnosis.

Roosa⁸ summarizes briefly: Persons who hear conversation better than the watch, who hear conversation better in a quiet room than where there is noise, who hear the tuning-fork better through the ear than through the bone, suffer from an affection of the labyrinth or nerve, and not from disease of the tympanum, although the latter may be engrafted upon the previous affection.

Barr,⁹ after examining 170 diseased ears (100 cases), formulates his conclusions thus:—

1. Increased bone-conduction by the test of Rinne or Weber, or by the watch, does not invariably and exclusively mean tympanic trouble; nor, on the other hand, does defective bone-conduction mean exclusive labyrinthine disease.

2. In chronic suppurative disease of the middle ear, there is an almost invariable preponderance in bone-conduction, while there may not be in the non-suppurative affections,—a difference which may be accounted for in accordance with Rinne's theory by the fact, that the labyrinthine structures are much less often involved in the purulent diseases of the middle ear than in the non-suppurating catarrh, or even in cases of ceruminous impaction.

Bezold,¹⁰ in an important paper (anticipating a more extended work) communicated to the Eighth Convention of South German and Swiss Aurists, generalizes as follows:—

1. In all bilateral affections of the ear, if there be not a too great difference between the two sides in acuity of hearing, a negative result of Rinne's test demonstrates a change in the conducting apparatus.

2. The conversion of this proposition is, however, not valid; that is to say, it is by no means true that in every affection of the middle ear we can expect a negative result of the test.

3. It may be shortened, but still be positive: (*a*) in chronic affections, if with a negative speculum and catheter examination, the hearing distance for whispered speech is relatively well preserved, *i. e.*, is over 1 metre (Lucæ); (*b*) in acute and subacute affections, with extravasation into the tympanic cavity, and that in spite of a marked diminution in the acuity of hearing.

4. In a unilateral affection of a high grade the result of the test may, on the other hand, be negative with the conducting apparatus intact; because in the experiment bone-conduction to the sound ear cannot be fully excluded as a source of error. (Baumgarten would rid himself of this contra-audition in the manner already described.)

Rohrer¹¹ has made observations in 400 cases with a view to establishing a relationship between the experiment of Rinne and the perception of sharp sounds produced by Galton's pipes and Koenig's rods, and reports:—

1. The result was positive in the majority of cases of affections of the external auditory canal and of mild otitis media and interna.

2. It was more often negative in cases of meningitis, serious otitis media, and otorrhœa.

3. The lowest tones of Galton's pipes were not perceived in otitis media and externa; the highest tones were not perceived in cases of impacted cerumen, otorrhœa, otitis interna and meningitis.

4. Examination with the vibrating rods revealed a diminution in the hearing of sharp sounds in those cases of middle-ear trouble where Rinne's test was negative, and above all in labyrinthine affections.

Lucæ¹² lays great stress upon variety of pitch and the forks employed. He uses c^1 and c^6 with weighted tines, and of such size that the standard ear will perceive the vibrations 35 seconds from in front of the tragus, and 10 seconds from the mastoid, which are the points he always selects for Rinne's experiment. He employs also Weber's test. His conclusions are:—

1. As to sound-perception (by bone- or air-conduction) the loss of high notes—in the sixth octave or above—if the forks are loud and the external canal is open, demonstrates an affection of the nervous apparatus; but if the perception of high notes is merely diminished, a diagnosis requires also a trial of lower tones, to determine whether there is simply a uniform weakening of the whole scale, or whether the higher tones have suffered also relatively; in which latter case the inference still holds good.

2. Weber's test, from any part of the cranium with a fork of any pitch, proves nothing except the integrity of the trunk of the acoustic nerve; but is a useful aid to other modes of diagnosis in cases of obstruction of the external auditory canal, purulent otitis media, with or without perforation, catarrhal otitis; or, in a word, whenever there is accumulated exudation in the tympanum.

3. Rinne's test is most available in chronic cases with negative mirror and catheter examination.

Bartsch¹³ shows that a partial vacuum in the external canal, produced by aid of a rubber-tube hermetically set in the meatus, can suspend the function of the sound-conducting apparatus. If, therefore, in a case of bad hearing this experiment results in a diminution of sound, we may infer that the sound-conducting apparatus is intact. If, however, the intensity remains constant, the sound-conducting apparatus is at fault. Diminution is to be expressed in terms of intensity and duration.

It may be observed that this test will be valid only in the case of forks of a low pitch, as shown by the experiment of Bezold before described.

Hartmann¹⁴ has contributed a method of graphic representation which greatly facilitates the progress of induction in this somewhat complicated theme. It requires a deal of memory and fantasy to group a multitude of phenomena, but the charts group themselves.

In the first place, for air-conduction he expresses vibratory duration for the patient's ear by the numerator of a fraction, and that (of the same fork) for the normal ear by the denominator; and then, to secure an essential uniformity in expression, reduces all fractions to a common denominator of 100. Inasmuch as the vibratory duration was much shorter when the fork rests upon a solid body than when it vibrates freely in the air, he does not register the bone-conduction in its ratio to normal bone-conduction, but in relation to the standard air-conduction. These results are registered upon a chart so arranged that the record of air-conduction occupies the upper part, that of bone-conduction the lower; and the records for the various forks used are placed in their respective columns. The forks are set in vibration, those of lower pitch by squeezing with the fingers and suddenly letting go, and those of higher pitch by sharply striking them upon a block of wood. Air-conduction is tested in front of the tragus, and bone-conduction on the mastoid. He does not seem to avoid contra-audition, as he sets the forks perpendicularly. The charts prepared in this way tend to arrange themselves into seven groups, which correspond to cardinal types of defective audition:—

I. Deafness greater low in the scale with good bone-conduction.

II. Deafness greater low in the scale with poor bone-conduction.

III. Deafness greater high in the scale with good bone-conduction.

IV. Deafness greater high in the scale with poor bone-conduction.

V. Deafness uniform throughout the scale with good bone-conduction.

VI. Deafness uniform throughout the scale with poor bone-conduction.

VII. Irregular deafness.

Types I. and II. are found on the one hand in purulent otitis media which has run its course, with destruction of the membrana tympani, and sclerosis of the tympanic mucosum; and on the other hand, in those processes which are termed dry catarrh (von Troeltch) or sclerosis of the mucosum,—processes in which the otoscopic examination reveals simply opacity and retraction of the membrana tympani or nothing at all.

Types III. and IV. are found generally in cases in which the mirror examination is negative, and which, from all the clinical phenomena and from all our hitherto-employed methods of examination, we have been accustomed to diagnose disease of the nervous apparatus. Furthermore, both types are sometimes met with, although rarely, when there is retraction and opacity of the membrane, and in a few cases of acute otitis media.

Types V. VI., to which belong the vast majority of cases, we meet most commonly in middle-ear affections, in perforation and discharge, although as well in cases where the membrane is preserved, either normal in appearance, or retracted and opaque. Here also are found cases of impacted cerumen and deafness from meningitis.

Type VII. is met in all kinds of aural disorders, as well in cases of suppurative otitis media which have run their course, and in sclerotic processes, as in cases where there is a normal appearance of the parts accessible to direct methods of examination.

PNEUMOTHERAPY OF THE MIDDLE EAR.

The pneumotherapy of the middle ear, in addition to the displacing of fluids, the re-establishing of ventilation, and the carrying of volatile medicaments, has also for its object the modification of tension. Pressure applied to the membrana tympani may be centrifugal or centripetal, and positive or negative. The methods of centrifugal application are the air-douche and its inversion, each of which offers a number of procedures. Symmetry would suggest also centripetally a positive and a negative pressure; but the latter is seldom if ever indicated, and has had no part in the discussions of the year. The positive method offers two procedures: that by steady pressure after the manner of Miot, and the intermittent "tragus pressure" of Hommel.

The essential elements in Politzer's procedure for raising the atmospheric tension in the middle ear are:—The production of pressure by a condensing apparatus; and, The production of counter-pressure by a muscular action which closes the naso-pharynx, with incidental opening of the tubal orifices. As to this counter-pressure, the maneuver of swallowing is cumbersome; and the Lucæ-Gruber articulation, "h e k," is inefficient. Much more effective is the act of attempting forced expiration against a resistance. If, then, Politzer's procedure be varied by the patient's attempting to forcibly expire through a tube into one of his own nostrils (the other being closed), he will fulfil all conditions of the experiment. The ordinary tube which bears the misnomer of "otoscope" will serve the purpose.

Prince¹⁵ has utilized the principle outlined above in a device for measuring and controlling the inflation, which is ingenious and useful enough to atone for his barbarism in calling it a "Politzometer." The postulate in his experiment would seem to be: that the effective pressure in the nasal cavity is not equal to that in the condenser, but to the counter-pressure needed to confine it; and that this counter-pressure, if produced by forced expiration against a resistance, is equal to the latter. The patient has therefore simply to blow into a manometer, upon the scale of which may be read the pressure of expiration, equalling the counter-pressure upon the air in the nasal cavity. The "Politzometer" of Prince is nothing more than a U-shaped open tube containing mercury, one arm of which is prolonged by a rubber-hose to the mouth of the patient. A scale completes the apparatus. The inflation can be performed by any condenser. Prince uses a Politzer's bag; but if the monometer were shunted on to the simple tube extending from mouth to nostril, such as described above, pressure and counter-pressure would of a certainty be equal, and the best conditions furnished for the experiment. In using the instrument it must first be ascertained by trial how much pressure (counter-pressure) is needed to overcome the Eustachian obstruction, and the patient should be directed in future inflations to displace only the required amount of mercury.

In the procedure by the use of the catheter the only novelty of the year is a report of Pollak's¹⁶ experimentation upon the cadaver to determine the condition and extent of a submucous emphysema

(such as is sometimes produced when the catheter immediately follows the bougie), and to explain, if possible, the fatal cases recorded by Andrew Turnbull.¹⁷ A small opening was made into the floor of the tube in that portion covered by the levator palati. Upon applying pressure the air penetrated through the connective tissue, between the levator and tensor palati, into the retromaxillary fossa. At the same time it penetrated the layers of the mucous membrane covering the soft palate, because the mucosum on the floor of the tube is continuous with that of the palate, and is limited laterally by the arcus palato-pharyngeus. Emphysema glottidis was not developed, because posterior to the border of the palato-pharyngeal arch the mucous membrane is firmly adherent to the muscular structures. Secondly, the air, after passing between the tensor and levator palati, penetrated along the inner surface of the internal pterygoid into the submaxillary fossa, where is to be seen how rapid an inflation of this region of the neck is possible. Involvement of the face takes place partly through the retromaxillary and partly by extension over the lower jaw from the submaxillary fossa. If the posterior wall of the pharynx be selected, the air penetrates along the great vessels into the mediastina.

The possibility of producing such untoward phenomena would seem to be a contra-indication to the use of bougies; but when the air-douch, by all three methods is insufficient to overcome the Eustachian obstruction, we must resort to some other method of forcing a passage. Miot¹⁸ proposes the electrolytic bougie, which in his hands has proved safe and efficient; while Baratoux¹⁸ by an undue current has produced stricture from electrolysis as marked as one might expect from the galvanic cautery. The success of Wolff¹⁹ in urethral electrolysis would by analogy encourage a similar attempt in the Eustachian tube.

The purpose of the air-douche is to restore the patency of the Eustachian tube and raise the intratympanic tension. Other indications may and generally do arise, which the douche does not meet: namely, to remove fluid and reduce the tension. To accomplish these latter the method of exhaustion through the Eustachian tube is proposed.

This method offers three procedures, which are inversions respectively of Valsalva's experiment, of Politzer's, and of catheterization.

The negative Valsalvian procedure, by which we shall designate the attempt at forced inspiration, with all orifices closed (although the same term has been applied to the act of swallowing with closed nares), has been advanced as an important therapeutic measure almost simultaneously by Bishop²⁰ and Savage.²¹ The question of priority between these gentlemen can best be settled by consulting the work of Sir William Wilde, which abounds in literature upon the subject. If the maneuver has succeeded, the patient will experience a metallic taste and the discharge may be perceived in the rhinoscopic image. Only after thus clearing the passage should one resort to passive motion of the ossicles, when such is indicated, by alternate inflation and exhaustion. When perforation of the membrana tympani exists, fluids may be poured into the external auditory meatus, and be drawn through into the naso-pharynx by this negative Valsalvian procedure.

For the second procedure, inverting that of Politzer, Cousins²² has devised an apparatus which at the same time, or more properly in alternation, performs exhaustion and inflation. It consists, first of a double nose-piece that for each nostril being provided with an inflatable collar of thin rubber which by inflation hermetically closes the opening. Connected therewith are two elastic bulbs, provided respectively with valves for inflation and exhaustion. A chamber is provided upon the injector side for absorbent cotton, upon which any volatile medicament may be placed. Counter-pressure by closure of the naso-pharynx is effected on the part of the patient by the act of forcibly blowing against some resistance,—preferably by a connecting tube into the inflatable collars, contributing thus his share to the success of the maneuver. The injector and evacuator are now put into alternate play, with the effect of clearing out the Eustachian passage, and giving passive motion to the ossicles. For home use a half-collapsed elastic bulb with a single nose-piece (the other nostril being compressed), and used alternately as an injector and evacuator, may be put in the hands of the patient. A preliminary cleansing of the nasal cavities by Dobell's or a similar solution is of course essential.

The third procedure, by which suction is performed through a Eustachian catheter, is too old to require description, and is only mentioned to preserve the symmetry of discussion.

It should be added that many observers, among them Seiler and C. S. Turnbull, deny the possibility, when the membrana tympani is intact, of removing fluid from the Eustachian tube in this way. Furthermore, C. S. Turnbull condemns *in toto* the practice of entrusting pneumotherapeutic measures to the patient.

The experiments of Lucae and Gellé were the first systematic attempts to investigate the effects of pressure applied centripetally to the membrana tympani. Lucae's condenser was the finger, applied to the external auditory meatus, while Gellé used a rubber-bag. The sound of a tuning-fork, as perceived from the vertex, was adopted as the measure of hearing. Both observers found that it was perceived by the normal ear at any of the pressures which they applied. Gellé adds: "1. The transmission of sonorous sensation indicates the normal state; it proves the mobility and elasticity of the conducting parts,—above all of the stapes. The abrupt interruption of the cranial sound at each sudden accession of air announces an exaggerated action of the aerial pressure upon the foot of the stirrup.

"2. The excessive forcing inward of the stapes causes obliteration of the oval window and abrupt arrest of the sound. This weakening of the sensation is often accompanied by tinnitus and vertigo, characteristic of an exaggerated action upon the labyrinth. Absence of this modification of the perceived sound indicates that the pressure has not passed the tympanum, and that the stirrup is immovable.

"3. The mobility of the membrana tympani is easily demonstrated. The positive and negative signs are well known. This must therefore be a sign of the immobility of the stapes, or at least of an interruption in the chain of ossicles."

These conclusions are by no means conclusive, and demand a few corrections:—

1. The transmission of sonorous sensations indicates a sufficiently normal state of the labyrinth for the perception of sounds conveyed to it by bone-conduction from the vertex. It proves nothing concerning the mobility and elasticity of conducting parts. The interruption at the sudden accession of pressure announces a raising of the intralabyrinthine tension, and has not to do with the ossicles in their acoustic function, although they may take a mechanical part in the production of this tension.

2. Absence of this interruption shows that we have not been able by means of the ossicles to effect labyrinthine compression.

3. If by other signs we are assured of the mobility of the drum-membrane and cannot by *sufficient* pressure upon it effect a *sufficient* compression of the labyrinth to interrupt the sound, we may conclude with Gellé that the stapes is probably immovable, or at least that there is an interruption in the chain of ossicles.

But the pressure must be *sufficient*, and it is to the determination of this *sufficiency* with a consequent revision of Gellé's conclusions, to which Miot²³ has devoted his attention. The results of his physiological research and clinical application we shall endeavor to briefly outline.

Before investigating the effects of different quantities and modes of pressure, a preliminary determination of the limits of safety is obligatory. Hartmann was enabled to rupture the membrana tympani in the recent cadaver by a pressure of 1900 grammes to the millimetre section (1400 mm. of mercury); Gellé by 2100 grammes (1600 mm.); and Miot by 1100 to 1500 grammes (800 to 1100 mm.). The last would therefore consider $\frac{4}{5}$ of an atmosphere (about 800 grammes) the extreme limit of safety in the living, and few will tolerate more than half as much. As to mode, if the pressure is intermittent much less will be endured. For example, 400 grammes from a reservoir will be better borne than 200 grammes from the pump. Furthermore, the opening and closing of the mouth would seem to be a factor in the problem; for example, a patient may bear 600 grammes with the mouth closed, who upon opening the same would find 400 intolerable,—for which Miot would account by supposing a difference, not in the labyrinthine impression, but in the support offered by the head of the maxilla.

The pressure which can be furnished by the various sorts of apparatus is as follows: from an ordinary bellows, 150 grammes; from the mouth, 200 grammes; from a Politzer's bag, 700 to 800 grammes; while the pump will furnish any required pressure. In Miot's experiments the pump alone was used, with a chamber to render the current constant.

A fork, constant in timbre, intensity and duration was selected, and was always placed upon the same point of the vertex. The patient kept his mouth closed. The subjects chosen were of two

classes : cases of normal hearing and cases of dry catarrh of the middle ear. Observations were taken : first, with the ear open ; second, with the apparatus in position, the manometer marking zero ; third, with a moderate pressure (200 to 400 grammes) ; fourth, with a high pressure (400 to 800 grammes).

First class.—The sound is “ a little more muffled, a little more intense and prolonged ” (*un peu plus sourd, un peu plus fort et prolongé*), when the tube of the apparatus without pressure is in the ear than when the latter is free.

A low pressure (50 grammes) suffices to cause a diminution in the intensity of the sound. Such a pressure, *as such*, cannot always be perceived ; but the difference in the intensity of the sound can always be distinguished. As the pressure increases we find no mathematical expression for the inverse relation between it and the intensity. For example, the sound is less at 400 grammes than at 0 ; but between 200 and 300, and 400 and 500 no difference can be perceived ; and passing the latter figure, symptoms of labyrinthine compression push aside all symptoms of sound perception. Miot finds in muscular action an explanation of this irregularity. As long as the pressure is feeble the muscles are not thrown into action ; as it becomes greater, however, the stapedius, antagonized by the tensor tympani, contract, forcing the stirrup unduly down upon the oval window. Finally, with a pressure too great for muscular antagonism, the stirrup is forced into the window ; but never, even when symptoms of labyrinthine compression arise, does the sound of the fork entirely cease,—an observation inconsistent with Gellé's statement : “ The excessive forcing in of the stapes causes obliteration of the window and abrupt arrest of the sound.” As to perceived duration of the sound a pressure of less than 300 grammes seems absolutely without effect ; while at a pressure approaching that of labyrinthine compression a slight diminution takes place.

Most subjects during or after the pressure experience a heat and burning in the external auditory meatus, due to congestion of the skin, sometimes sufficient to produce minute hemorrhagic foci in the canal and membrana tympani, and most often in the posterior superior quadrant. Cough from irritation of the vagus may render further experimentation impossible. The auditory disturbance is of a very transitory character, although it cannot be doubted

that a too-great pressure might not only do permanent damage to the hearing, but might also endanger life.

Second Class.—This comprises cases of otitis media sicca in two series: those hearing the watch at a distance of several centimetres, and those hearing it only on contact. The cranial perception (of the watch) was *nil*. In the first series the raising of tension from zero to 100 grammes produced an appreciable effect upon the sound; while in cases where more or less false or true ankylosis between the ossicles (especially at the stapedio-vestibular joint) was manifest, no diminution was evident. With a high pressure the audition was in many cases increased. In the patients of the first series a diminution of the tinnitus and deafness was noted. These are considered cases of stapedial error. In the second series one was frequently surprised at the marked amelioration of the symptoms.

Miot summarizes as follows: "Low pressure exerted upon the membrana tympani in a person of normal hearing produces but slight effect upon the stapedio-vestibular joint; moderate and great pressure produce only symptoms of compression, such as tinnitus, vertigo, etc., which manifest themselves at different pressures according to the sensibility of the subject. Low pressures have no effect upon the stapedio-vestibular articulation in cases of otitis media plastica. The more this joint is impaired the greater is the needed pressure. Moderate and strong pressures are sufficient to determine the degree of ankylosis, and a frequent repetition is of advantage in certain cases which would become aggravated if left to themselves."

The *tragus pressure* of Hommel²⁴ is a maneuver which consists in pressing upon the tragus 120 to 150 times in a minute; and this performance is generally repeated six or eight times a day. The author employs it: 1, in chronic, simple and suppurating catarrhs of the middle ear; 2, in acute, simple and suppurating catarrhs, when the fever has passed; 3, in perforations of the membrana tympani; 4, in sclerosis of the middle ear. He has had excellent results in 80 cases, while the results which Schwartze²⁵ and Rohrer²⁵ obtained by the procedure are negative. He believes that motion is obtained of the membrana tympani and ossicles; while Lucae accepts this only as respects the membrana, and Trautmann²⁵ denies its possibility in cases of sclerosis of the middle ear

and ankylosis of the stapes. Hommel cautions against a too frequent repetition, and has himself set up a myringitis in several cases, which forced a suspension of the procedure. The whole matter still remains relegated to the investiganda.

SYMPTOMATOLOGY.

Tinnitus Aurium.—A classification of subjective noises which will guide in diagnosis and treatment demands the adoption, as a *fundamentum divisionis*, of some factor essential to the disorder.

Claiborne²⁶ details in anatomical sequence the various diseases with which this symptom is associated; and, after an extended casuistic, concludes with his initial proposition: that an enumeration of the causes of deafness would be an enumeration of the causes of tinnitus aurium, and that the treatment for it would be also the treatment for the attending deafness.

Kiesselbach,²⁷ after elaborate investigation, attempts no classification of the phenomena, but generalizes concerning the etiology of the symptom itself: 1. Tinnitus is produced by hyperæsthesia of the sound-perceiving apparatus. In some this condition is a constant feature, in others transitory,—the result of a sudden change in the intra-labyrinthine pressure. 2. The hyperæsthesia itself cannot produce any sound perception, but gives rise to the possibility of hearing in an exaggerated degree the blood noise constantly present, and this is principally due to the increased resonance sound of the cavities of the middle ear. In normal conditions this blood noise or resonance sound is not perceived as a result of irritation. 3. It is possible that an increase of blood noise, or a heightened irritability of the terminal acoustic filaments, in itself may suffice to render the tinnitus perceptible. In the majority of cases, however, both factors come into play.

Laurence Turnbull²⁸ bases his classification of noises upon the *quality* of the sound, and enumerates the pathological conditions associated with each: 1. A constant “rushing, knocking, or pulsating noise” is a rare form, and depends almost always upon venous or arterial hyperæmia of the cochlea; upon effusion of blood, serum, or pus into the labyrinth or semicircular canals; ecchymoses in the vestibule; or upon extra-aural causes, as aneurism, anæmia, chlorosis, lithæmia; above all, upon temporary or permanent changes in the blood-vessels in and around the ear.

2. Moist sounds in great variety depend for their description—as “gurgling, bubbling, boiling, singing, whistling, shell-like roaring, etc.”—upon the patient’s occupation and intelligence. They indicate the presence of fluid upon the drum-membrane or within the tympanum; catarrh of the Eustachian tube or naso-pharynx; or upon irritation in the external auditory canal and mastoid cells.

3. “Dry, roaring and ringing” noises are associated with a large number of diseases of the ear,—with chronic, non-suppurative catarrh; with muscular error in the conducting apparatus; with tumors exerting pressure upon the ear and auditory nerve; and with nervous lesions, as in cerebro-spinal meningitis, Ménière’s disease, and syphilitic affections of the nervous apparatus. This is an important step toward a classification of sounds which will correspond to a logical classification of the aural diseases causing them.

Hartmann²⁹ distinguishes first, etiologically, three kinds of noises,—subjective or nervous, entotic and objective. The first are caused by nervous irritation, either in the brain or labyrinth, arising from alteration in the blood-supply or some other influence, as inflammation. The second have their origin in the middle ear or its neighboring parts, and are transmitted to the internal ear. Objective noises (in this sense) are not pathological. The objectivity of the sound, or its location without the organism by the perceiving mind, is another matter. Entotic noises arise either in the blood-vessels (carotis, *auditiva interna*, *vena jugularis*, *sinus transversus*), from contraction of the muscles (tensor tympani, stapedius, etc.), from movements of the *membrana tympani* or the walls of the Eustachian tube, and from collections in the tympanum. The perception of these sounds is favored by all factors increasing resonance in the ear, and by hyperæsthesia of the acoustic nerve. If they can be heard by auscultation they are called “objectively perceivable.”

A complete logical division of subjective sounds, based upon their character, would be as follows: They are either noises or musical notes; the latter are either fixed and are high or low, or vary in pitch and are either in melodic succession and rhythm or are confused.

Hartmann²⁹ does not apply so rigid a division of the phenomena, but selects four types of which he has made observation, and in

which he has achieved considerable success in showing an association of each with a corresponding pathological condition: 1. Tinnitus of a high pitch—singing, hissing, chirping—most frequently occurs in active or passive hyperæmia of the hearing organ, in acute or chronic catarrh of the tympanum, especially when there is a secondary implication of the labyrinth. It may also occur spontaneously in health, or be “reflected,” as when one sharply shuts the eyelids, or at cathodal closure or anodal opening, and may persist after hearing a loud detonation. These noises are analogous to the ocular phenomena resulting from hyperæmia or pressure upon the eyeball. 2. Tinnitus of low pitch—rushing, humming—occurs with cerebral tumors, with labyrinthine affections, either primary or caused by undue pressure of the stapes, or are either vascular or muscular murmurs, either sufficient in themselves to be heard, or through a heightening of the aural resonance. An enumeration of the diseases associated with this form of tinnitus would include anæmia, chlorosis, aneurism, otitis media sicca, ceruminous impaction, polypus, blepharospasm, etc. 3. Full melodies arise from an excitation of the cerebral cortex, and are strictly hallucinations. To this class belong also voices, croakings and chirpings. 4. Noises or non-musical sounds arise from disturbance of exudation in the tympanum or neighborhood, or from a change of position in the conducting apparatus.

The rational treatment of tinnitus is the removal of the diseased state with which it is associated; and here too, as elsewhere in therapeutics, we have to do not so much with rival procedures as with respective indications. Nevertheless, as the disease is often incurable and the distressing tinnitus remains an opprobrium to Otology, we are forced to seek an amelioration of the symptom itself, although often conscious of the irrationality of such a hope. Having removed all the pathological factors which are accessible, the only further resource is to lower in some way the functional power of the auditory nerve, or by exercising another portion of the scale to render the tinnitus less prominent in the patient's consciousness.

Perhaps the largest number of cases are reached by the bromides, since they are at the same time vaso-motor and nervous sedatives, and especially meet the indications when vascular error is responsible for the tinnitus. Hydrobromic acid has shown itself to

be inferior to the bromides, especially of potassium.³⁰ The fact that quinine in large doses (0.5–1.0 grammes) modifies in some way the intra-labyrinthine circulation and causes a ringing would lead to a trial of it in tinnitus of similar character. Pilocarpine is not only one of the most effective agents for promoting the absorption of hemorrhagic and inflammatory products, particularly within the intracranial system of vessels and lymphatics, of which that of the labyrinth is an annex, but has also the power of determining an increased blood-supply to the middle ear;³¹ and would therefore seem useful in cases of tinnitus not only from recent and minute hemorrhage in the labyrinth and from meningitis, but also from atrophic affections of the tympanum.

Without doubt the most effective agent for modifying the irritability of a nerve—at the time of its exhibition, if not permanently—is the galvanic current. Brenner's discovery that the normal formula of the acoustic nerve is that of a motor one is the key to the whole subject, and since its elaboration by Erb³² nothing of importance has been added. It should be remarked that this normal formula cannot, owing to the enormous resistance offered by the enclosing structures, be obtained except in the case of a *hyperæsthesia acoustica* sufficient to cause a tinnitus. With "simple galvanic hyperæsthesia" the formula reads: Ka S—K (sound), Ka D—K > (decreasing), Ka O— (no sound), A S—, A D —, A O — k (faint sound).

The production of anelectrotonus by A D is therefore indicated. Even the slight irritation from A O may be avoided by gradually diminishing the current before removing the electrodes. This simple galvanic hyperæsthesia is observed, according to Hartmann,²⁹ in the greatest variety of ear-diseases: in purulent inflammations of the middle ear, in chronic catarrh, in sclerosis of the tympanic cavity, and in affections of the nervous structures. In like manner, when the nerve exhibits the characteristic reactions of degeneration, Ka D and A O are indicated,—the one to increase the irritability and the other to furnish an irritant. Brenner reports "a paradox formula" in one case: Ka S—, Ka D—, Ka O—K (this time a hissing), A S—K, A D—K (continued), A O—. Permanent relief from the tinnitus was effected by Ka D with avoidance of Ka O, although the normal formula was never reëstablished. Erb's³² practice is to make a preliminary

application of cathodal and anodal opening, continuance and closure, to determine at what electrical mode the tinnitus ceases or is at least diminished, and to repeat this thereafter as a therapeutic measure, carefully avoiding those modes through which the tinnitus is augmented.

The observation of Urbantschitsch and Itard, that objective sounds often modify favorably or unfavorably the subjective sounds of tinnitus, is the foundation of Lucae's phonotherapy, or "Tonbehandlung." This consists essentially in removing from the patient all sounds in that portion of the scale occupied by the tinnitus, and in subjecting him to sounds occupied by the remaining portions. For this purpose not noises, but musical vibrations must be used, and the instrument must be as free as possible from overtones. Clinically, Lucae selects a tuning-fork, maintained in vibration by an electro-magnet and as far removed in pitch from the subjective sound as convenient. For hissing, ringing, whistling tinnitus he selects the low C or C¹; and for rushing, humming, buzzing, uses C³ or C⁴. The stem of the fork is placed in the meatus, and the *séance* lasts one to five minutes. This mode of treatment has an analogy in the combined rest-cure and passive exercise so useful in general nervous hyperæsthesia. By phonotherapy Lucae and Barr⁸⁹ have had numerous cases of surprising success in lessening or abolishing the tinnitus, and have furthermore observed, as had already been noted by Erb in his electrotherapeutic applications, that as the subjective noises disappear the hearing of objective sounds improves,—which brings us back to the proposition of Claiborne, that the cures of tinnitus and deafness are identical.

Aural Vertigo.—The doctrine of an aural vertigo has had three stages of its evolution: Deleau³³ located the trouble in the middle ear, in citing the various phenomena which show a "sympathy" between the ear and the brain and other organs. Ménière regarded the phenomena as apoplectiform and dependent upon diseases of the *internal ear*, and formulated his conclusions as follow:—³⁴

1. An auditory apparatus previously perfectly normal may suddenly become the seat of functional disturbances consisting in noises of a variable nature, continuous or intermittent, and which may be accompanied sooner or later by a diminution in hearing.

2. These functional troubles, having their seat in the *internal auditory apparatus*, may give rise to cerebral disease, such as intense vertigo, uncertainty of gait, turnings to the right and left, and falling, and these may be attended with nausea, vomiting and syncope.

3. These manifestations which are often of intermittent type, are at last followed by deafness, gradually growing worse, and often the hearing is at last totally and suddenly lost.

4. All this tends to confirm the belief *that the lesion which is the cause of these functional troubles is in the semicircular canals*. (The translation and italics are Dr. Chas. H. Burnett's.³⁵)

Politzer³⁶ was the first to observe vertiginous attacks in cases of middle-ear trouble with abundant exudation; and Hessler³⁷ observed the same upon sudden closure of the Eustachian tube. According to Woakes,³⁸ vertigo, deafness, tinnitus, nausea and vomiting may be associated with an affection of the inferior cervical ganglion of the sympathetic, which, as he points out, is not only a factor in controlling the vertebral artery and the labyrinthine circulation, thus determining the aural symptoms proper, but by its connections with the vagus determines also the gastric disturbance. He finds also a therapeutic hint in the fact that this ganglion is functionally depressed by quinine and tobacco, and stimulated by hydrobromic acid.

Autopsies are rare, Gellé enumerating only seven, including three which he himself has made, and which have been reported during the year.⁹⁰ To these may be added the four of Moos⁹¹ in cases of labyrinthine diphtheritis. The results of Gellé's investigations are thus summarized by Bull:—³⁹

1. The vertigo attack of the acute type may exist for several years without lesions of the labyrinthine nerve or of the auditory nerve. 2. The vertigo is met with in the most diverse lesions of the middle ear. 3. These lesions of the drum-cavity all present the following common characteristic: They all tend directly or indirectly to close incompletely the labyrinth, either by ankylosis of the stapes to the oval window or by obliteration of the round window. 4. The mechanism of the shock or commotion of the labyrinth is explained by the loss of all safety valves; every movement, even vibratory, to which it is subjected causes an injurious shock and provokes the reactions known since the time of Flour-

ens, under the influence of traumatism of the semicircular canals. 5. The mobility of one part of the labyrinthine wall is indispensable to the production of abnormal irritation of the labyrinthine nerve, and explains the intensity of the effects consequent on any concussion. 6. An important element necessary to the comprehension of the genesis of the auricular vertigo and its varieties is the state of reflex hyperæsthesia and hyperexcitability of the acoustic nerve, due to the repetition of local and functional irritations. 7. The vertigo may exist with or without tabes.

In accepting these propositions we would disassociate the name of Ménière from the general term of aural vertigo and confine it to that group of phenomena which are common to the various forms of acute primary labyrinthine disease.

C. H. Burnett³⁵ formulates our present knowledge of aural vertigo in language too concise for further condensation, and the importance of the subject justifies a reproduction *in extenso*:—

“It is highly probable that in every case of ear-vertigo the semicircular canals are irritated and cause the vertigo, but the primary lesion need not be there. At most they are in many cases but the seat of a reflected irritation originating, it may be, from undue pressure on the drum-head, on the ossicles, and mediately through the labyrinth fluid upon the ampullæ of the semicircular canals.

“Why there should be any such phenomenon as aural vertigo, depends upon the structure of the auditory nerve. Some of the fibres of origin of this nerve are closely connected with a mass of motor fibres in the bulb which pass into and are continued in the inferior peduncles of the cerebellum. The latter is connected with the medulla oblongata by its inferior peduncles, which pass downward to the back of the medulla to form part of the restiform bodies. It is well known that injuries of these peduncles cause disturbances in motion similar to those observed after irritation of the semicircular canals. The motor fibers of the auditory nerve are connected specially with the ampullæ of the semicircular canals. It now becomes very plain why irritation of the ampullæ may cause symptoms similar to those observed by irritation of the restiform bodies, because in both cases the irritation passes to the afore-said motor cells in the bulb. Aural vertigo may be termed a reflex cerebellar phenomenon from irritation in the auditory apparatus.

“Aural vertigo may be defined as a vertiginous condition in-

duced by irritation in the auditory meatus apparatus characterized by tinnitus, deafness, dizziness, nausea and vomiting, not usually excessive when the irritation lies solely in the middle ear, and entirely relievable by removal of the cause of disease from the external ear. All of these symptoms are increased in intensity and duration when the cause of irritation is in the middle ear. Syncope may be added if the nausea is excessive, but loss of consciousness rarely occurs in any form of aural vertigo, which latter fact serves to differentiate it from epilepsy or apoplexy. When the internal ear is the seat of irritation the symptoms are usually sudden and profound. The deafness is marked at the outset, and the hearing is never regained. All the other symptoms abate in the course of a few hours, or days, at most. The subject of the last-named symptoms (the real Ménière's symptoms) is usually in a depressed condition of health, and has generally been subject to some great mental or physical strain, or both combined.

"Ménière's disease therefore, according to Ménière, is a disease of the internal ear only; but the symptoms which he described as characteristic of it are quite generally applicable to all forms of aural vertigo, and hence the confusion in the use of the name. A true Ménière's disease, according to Ménière, presupposes a perfectly healthy ear. Such instances of ear-disease occurring in healthy ears are very rare. All cases of aural vertigo with its Ménière symptoms which I have observed have been characterized by the undoubted symptoms of a previous disease—usually catarrhal—in the middle ear. Sometimes in the debilitated acute catarrhal or muco-purulent otitis media is attended by well-marked and even excessive vertiginous symptoms.

"The diagnostician should bear in mind that aural vertigo is the general term, Ménière's disease the particular form; that the former is common, the latter rare; that aural vertigo from irritation in the external and middle ear is not usually attended with great or incurable deafness, whereas true Ménière's disease is necessarily attended with profound and permanent deafness. Also aural vertigo can be excited artificially, as, for example, by injecting cold water into the external and auditory canal. Ménière's disease, on the other hand, must necessarily depend upon an organic lesion. All forms of aural vertigo are paroxysmal excepting those dependent upon the presence of a foreign substance in the external ear

pressing upon the membrana tympani, and upon a morbid growth in or upon the auditory nerve. In the latter there is a permanent, though it might be a slight, tendency to reel or to walk in a one-sided manner. As the tumor enlarges the vertigo may become intense and distressing, and the equilibrium so much interfered with as to forbid walking alone. While this may be considered a form of aural vertigo, it is not Ménière's disease, because it is not strictly caused by irritation in the middle internal ear, and the vertigo is not paroxysmal but constant."

Dysacusis (so-called Hyperacusis).—Lannois⁴⁰ offers an ingenious explanation of the diminished hearing sometimes observed during the act of mastication, and the distressing sensibility to sound which not seldom accompanies paralysis of the facial nerve. The tensor tympani is supplied through the otic ganglion by the motor branch of the trigeminal, and shares in the innervation of the masseter during mastication, thus throwing the membrane into undue tension. The stapedius, on the other hand, is supplied by the facialis, and cannot, therefore, in paralysis of the latter, antagonize the action of the tensor tympani, so that movements of the membrane and malleus are precipitated uncontrolled upon the labyrinth.

Rosenbach,⁴¹ in reporting three cases of disturbed audition appearing and disappearing with facial paralysis of rheumatic origin, attributes its origin either to paralysis of the stapedius or to simultaneous inflammatory involvement of the facialis and acousticus.

Cephalgia Pharyngo-Tympanica.—Dr. E. Legal⁴² of Breslau, reports ten out of a series of thirty cases in which the cardinal symptoms were neuralgiform pains in the temporal and occipital regions—paroxysmal, periodic, generally unilateral—accompanied by slight aural symptoms (subjective) or none. The following sensitive points were noted:—

1. Point temporal of Valleix—one-half cm. in front of superior border of the tragus—constantly.
2. Major occipital—at the point of emergence from under the trapezius—frequently.
3. Temporal branch of subcutaneous malæ—rarely.
4. Supra-orbital—whenever the nasal mucosum was involved.

Examinations revealed:—1. Altered reflex of the membrana tympani. 2. Fibrous degeneration of the membrana tympani (two cases). 3. Perforation of the membrana tympani with

accumulation of inspissated pus, etc. (one case). 4. Sinking of the membrane (most cases). 5. Stoppage of the Eustachian tube on side with the pain (all cases). 6. Pharyngeal catarrh (all cases). 7. Follicular pharyngitis (one case). 8. Hypertrophic rhinitis (in case where supra-orbitalis was involved). 9. Post-nasal fibroma (one case).

Absent or not marked were:—1. Tinnitus. 2. Vertigo. 3. Deafness. 4. Pain in the ear. (In other words, there were no subjective symptoms pointing to the ear.)

Treatment.—1. Iodine and glycerine to pharynx. 2. Nitrate of silver to nares, pulverized, one per cent. 3. Galvano-cautery to follicles and hypertrophies. 4. Local treatment to the middle ear, in the case of perforation. 5. Politzer—(frequently failed). 6. Eustachian catheter—(always relieved pain).

Catheterization seemed in several cases to abort the paroxysm. Each inflation of the middle ear seemed to diminish the intensity of the paroxysms. From four to six inflations, in most cases, sufficed. Until the naso-pharynx was restored to the normal condition, the cephalalgia was prone to recur.

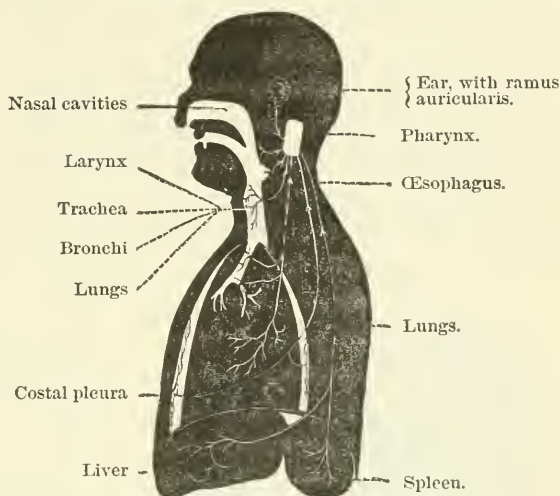
The experience of Hartmann⁴³ and Rohrer⁴⁴ has confirmed the utility of carbol-glycerine instillations (10 to 20 per cent.) in painful inflammatory affections of the middle ear, and such would seem also here to have place. No cases have yet been reported of aural cephalgia with negative mirror examination, but it is perfectly conceivable that error in the trigeminal supply to the ear might be experienced in the whole distribution of that nerve. In such a case, the success of Gomperz⁸⁸ in the relief of otalgia nervosa by antipyrine (1.00 to 1.50 grammes pro dosi) would warrant also a trial here.

Reflex Dental Otalgia.—We should not in this connection lose sight of this peculiar form of ear-pain, due not only to carious teeth, but also in a special form to the eruption of the molars in a child, and of the wisdom teeth in the adult—the latter existing for months to demoralize the patient and tax the ingenuity of the inexperienced. The diagnosis is by exclusion and upon interrogation of the teeth. Lancing the gums is indicated in the case of children who are cutting teeth, but only adds to the misery of an adult. Almost the only resource is the instillation of local analgesics suspended in fluid cosmoline. The subject has received full con-

sideration in all recent standard works upon dental and oral surgery.

Ear Cough.—Of all afferent nerves, the vagus affords the least accurate information concerning the localization of the point of irritation in its distribution. In this manner a stimulation of the ramus auricularis may act in the respiratory center as an irritation of the superior laryngeal, inhibiting inspiration and determining expiration, and thus precipitate a cough.

Jakins⁴⁵ furnishes a diagram of the anatomical elements involved in this "reflex" act, and reports a case in which the phenomena of cough, emaciation and night sweats, together with a "prognosis valde dubia" of the faculty, disappeared promptly upon the removal of impacted cerumen.



REFLEX COUGH DIAGRAM.—(London Practitioner.)

AURICLE.

Anomalies.—Rohrer⁴⁶ reports 72 cases, and offers a classification into six groups:—1, naevus upon the auricle and neighboring parts; 2, arrests of conformation, or hypergeneses; 3, new epithelial formations, or hyperplasias; 4, arrest of conformation in the concha and tragus; 5, excess of conformation; 6, localization of dermatoses.

L. Turnbull¹⁰⁰ contributes an unpublished illustration showing bilaterally a rudimentary auricle, with absence of the meatus. The watch could be heard upon contact.

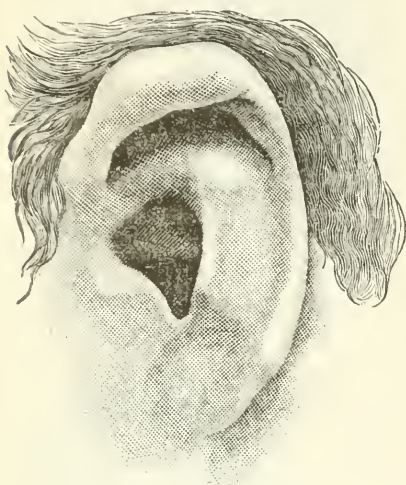
Snell⁴⁷ describes three cases of congenital defects of the ear. The deformity differed entirely in the three cases. In the first, on



RUDIMENTARY AURICLE.

the deformed side there was nothing resembling an auditory meatus; the upper part of the auricle was represented by a cartilaginous ridge ending below in a soft fleshy portion somewhat like a piece of lobule. On this were one or two mere crevices, representations of the external meatus. In the second the greater part of the external ear was absent, the auricle being represented by little more than its external rim (helix and anti-helix), there being no tragus, anti-tragus, nor any other cartilaginous portion. Meatus also absent. In the third case the cartilaginous portion of the ear was practically absent, the external ear being represented by little else than the lobule. Meatus also absent. Although thus differing as regards deformity, they resembled each other in the condition

of the auditory nerve, hearing being present in all with watch in contact; and in one of the cases it was heard even at a considerable distance.



CONGENITAL ABSCESS OF LOBE.

Blower⁴⁸ reports a case of congenitally imperforate external auditory meatus, which ends about half an inch from its commencement in a cul-de-sac; and upon feeling the bottom of this with a probe, it will be found that there is tone beneath the skin. There is also a stenosis of the other (right) side, about half an inch from the commencement, it being hardly an eighth of an inch diameter at this point. There is also some otorrhœa. The patient is of course very deaf, but can hear the vibrations of a tuning-fork, when placed close, even to the left ear. It was not deemed advisable to operate in order to make a meatus to the left ear. The right was treated by sponge or laminaria tents.

The accompanying cut represents a cast made by C. S. Turnbull¹⁰⁰ of the ear of a young man who presented bilateral absence of the lobe and congenital imperforate meatus. Audition was tolerably well preserved, his hearing distance from the watch being several feet.

A remarkable instance of hypertrophy beginning at middle

age is related by Ménière.⁴⁹ It concerned a young man of 34 years, of excellent constitution, presenting no discoverable diathesis, syphilitic or otherwise, who noticed two years ago that the auricle of his right ear was developing in an extraordinary manner, and at the same time was becoming flattened. This modification proceeded little by little and almost imperceptibly. It was only at the end of a year that the left ear began to undergo the same change, and the patient becoming alarmed, sought advice. Upon examination, the right concha appeared flattened. The whole cartilaginous portion presented a hypertrophic thickening very marked, but at no point was the skin more firmly adherent than is normal. The tendency of the helix was to roll up, and the anthelix to flatten out. The lobe had ordinary dimensions. There was the same condition on the left side, but to a less marked degree. On either side the deformity was symmetrical. Neither ear presented any other symptoms of disease. Of course operative procedure was out of the question.

Neoplasms.—The possible malignancy of epithelioma of the auricle is illustrated by a fatal case reported by Kales.⁵⁰ The patient, advanced in years, had a neoplastic family history, refused all operative relief. The growth remained stationary for five years, and then assumed a deadly activity, involving the whole auricle in two months, and terminating fatally a few weeks later, by involvement of the tympanum and beyond.

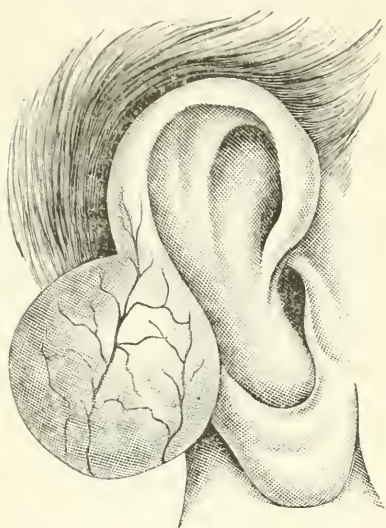
Miot⁵¹ reports a case treated by the galvano-cautery, and Pooley⁵² one treated by the knife, in which recurrence did not take place. With such additions, the statistics speak for early operation.

That a papillomatous growth may simulate in appearance epithelioma, is illustrated in the case recorded by Felici,⁵³ in which a long-neglected otorrhœa with secondary ulcerative perichondritis of the canal, had caused hypertrophy and degeneration of the cartilage and involvement of the auricle in the same process. The general condition, also, resembled a cancerous cachexia, but simple removal of the growth from tympanum, auricle and canal, and an after treatment by boric acid in saturated alcoholic solution, effected a permanent recovery.

Hæmatoma and Cyst.—Hartmann⁵⁴ and Seligmann⁵⁵ report five new cases of cyst-formation in the auricle, in which hæmatoma and perichondritis could with certainty be excluded. All cases had

this in common: That those affected were well nourished, healthy individuals, without psychopathic tendencies; that there had been no previous trauma; and that the appearance of the tumor was unaccompanied by inflammatory phenomena. Early incision brought to light only a pale-yellow fluid. In no case was there a red or black coloration, flocculi of fibrin detritus, or anything which suggested a former hemorrhage.

The processes predisposing to hæmatoma may be also regarded as the preliminary stages of simple cyst-formation;⁵⁴ and, on the other hand, a hæmatoma may be converted into a cyst.⁵⁶ As to the relation between either of these tumors and perichon-



TRAUMATIC CHONDROMALACIA OF AURICLE.

dritis, we know that the latter is accompanied by the phenomena of inflammation. A mucin-metamorphosis in the cartilage, leaving spaces filled with fluid, and a connective tissue development with enlarged capillaries, constituting chondromalacia,⁵⁷ require only a sufficient serous transudation to form the cyst; while in case of great vascular disturbance in the part, such as may be artificially evoked by section of the rectiform bodies,⁵⁸ or in the case of trauma, the lessened resistance without the vessels may predispose to hemorrhage. In fact, we do most frequently meet with both cysts and hæmatoma where we can demonstrate chondromalacia, viz., in the aged,⁵⁹ in children suffering from tuberculosis and extensive caries,⁶⁰ in the insane of degenerative type, after Asiatic cholera, especially in men,⁶¹ and in certain animals in apparent health, notably swine.⁶²

That the chondromalacia may also independently of hæmatoma be of traumatic origin is illustrated by the unique case of C. S. Turnbull,¹⁰⁰ of which the accompanying cut in life-size is taken from a water-color. The subject, a victim of mayhem, had some weeks before been bitten upon the edge of the concha, and as soon as the wound closed the swelling began, and rapidly increased. It was

of a purplish color, and underwent changes in size, shape, and tension, with every variation in atmospheric conditions and in the blood-supply to the head. When the owner of the tumor was embarrassed or in a hot room, it was double its usual size, nodulated, tense, and throbbing; while in the cold or forgotten, it was relaxed and shrivelled. This unique growth was removed by the ligature and knife, and on section revealed a chondromalacia with telangiectotic vessels in the newly-developed connective tissue.

The conversion of a hæmatoma into an apoplectic cyst is by the well-known process which occurs in tissues not sufficiently well supplied with lymphatics to insure the absorption of blood, and in the absence of conditions determining an inflammation. The product is a connective-tissue capsule filled with serum, flocculi, and the residua of retrograde hæmoglobin metamorphosis. If hæmatoidin be absent, the tumor may be pronounced a simple cyst.

The occurrence of hæmatoma in the insane requires no separate consideration pathologically. There is simply in the degenerative type a more frequent chondromalacia of the auricle and septum nasi;⁶³ and, according to von Gudden, the likelihood of a trauma taking place reaches its maximum in the left ear of an insane male patient attended by a right-handed nurse.

That hæmatoma from injury may occur without previous chondromalacia is a matter of common observation, although the experimental production of such in animals requires extraordinary violence, and its development is generally delayed a number of days.⁶⁴ The hemorrhage need not in this case be subperichondrial, and there are greater variations in the site. The extravasation may even involve also the external auditory canal and tympanum.⁶⁵

In the treatment of hæmatoma auris, the general principles of bone-surgery prevail. Pressure should be applied to the part *not* involved in the tumor. Applied directly to the latter, the nutrition of the cartilage would be in danger, and necrosis or deformity ensue. Suppuration is, however, rare. Massage, to be of service, had best be immediate,⁶⁶ before coagulation takes place, and may be aided by hot-water applications.⁶⁷ At a later stage Sanger Brown⁶⁸ adds galvanism and leeching to the treatment, and reports three cases (two of them occurring in the course of puer-

peral mania) in which he achieved success. The galvanic current was used twice daily, and massage was applied every four hours. According to Hartmann,⁶⁹ the method by massage requires a length of time equal to that by incision.

If the contents of the sac are still solid, incision will generally be required; if fluid, this may be avoided. Seligmann⁵⁵ prefers paracentesis by means of a Pravaz syringe to Follin's method of multiple puncture. Lebrun,⁷⁰ having had ill results by both as well as by incision, resorts to another procedure. Having inserted canulas 1 and 3 of Dieulafoy's aspirator into the tumor, he withdraws the fluid through the larger, and through the other injects 1 to 3 grammes of a 2 to 10 per cent. solution of iodoform in ether. The pain is transient, and no dressing is required. The experiment in one case of injecting without a previous evacuation resulted in prolonged pain and an eschar.

The practice of Vienna hospitals is described by Neumann as follows:—⁷¹

"The tumors are always opened by an incision at the deepest point, through which the greater part of the fluid is discharged. By a gentle pressure at the circumference the tumor has to be emptied as much as possible. The incision is kept open by strips of gauze, and compression, which is of the greatest importance, is applied by filling the auricular cavity and the space between the auricle and the skull with pads of cotton-wool, and carrying turns of the bandage across the auricle, the occiput, and the forehead, whereby a moderate and equal pressure will be exerted upon the walls of the empty tumor and the auricle. On the following day the dressing is removed in order, by gentle squeezing, to again empty the tumor of the fluid which generally has reaccumulated. Occasionally suppuration takes place, which has to be treated like a common open abscess. In most cases, however, the fluid discharge ceases after a few days, and the tumor, which has considerably shrunk in size, feels like a hard fibrous growth. Henceforth the incision is permitted to heal, but the compression has to be continued for some time, and the diminution of the tumor is assisted by massage. After a fortnight to four weeks, only a circumscribed, hard growth of the size of a bean will be found in place of the large disfiguring tumor, and the auricle will have resumed its normal color and shape. In cases in which suppuration of the

cartilage has taken place, and in which the exfoliated fragments are not rapidly enough spontaneously cast off, they may be removed by carefully scraping with a curette, whereby the suppurative process will be shortened and the shrinking of the tumor materially accelerated."

EXTERNAL AUDITORY MEATUS.

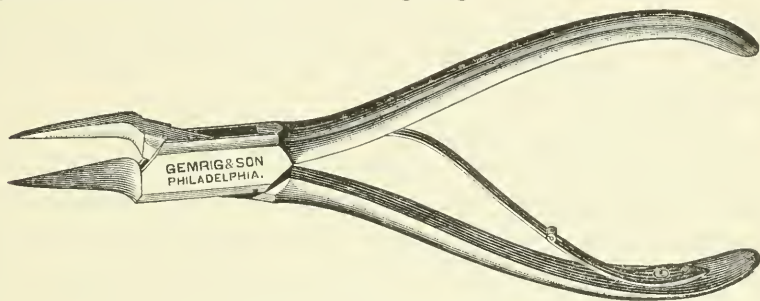
Furunculosis.—The year has furnished much literature and little novelty in the matter of furunculosis of the external auditory canal. Loewenberg⁷² repeats his observations of 1880 and 1881,⁷³ to the effect that an infection takes place from without through the ducts of the cutaneous follicles, that successive outbreaks are due to auto-infection; and that the ailment can be readily communicated to another by want of antiseptic precaution. As to pathogenic organisms, he found staphylococcus pyogenes albus absent in only one case; aureus was less common, and citreus rare. Kirchner⁷⁴ found only albus. The antiseptic treatment which seems now popular was already fully detailed by Politzer⁷⁵ some time ago. Loewenberg has achieved good results by the use of a saturated solution of boric acid in alcohol, with repetition of the same as a prophylactic against recurrence, or in case a marked periodicity leads to the expectation of an attack,—as for example in certain cases where furunculosis accompanies each menstruation. He does not urge incision, as he deems a division of the duct at fault as essential as it is difficult. Some caution is needed in the instillation of alcohol when there is a perforation of the membrana tympani, owing to an intolerance of the middle ear to such an irritant as was observed by Schwartze some time ago. Schulte⁷⁶ reports a case in which the instillation was followed by paralysis in the distribution of the chorda tympani, with loss upon the corresponding side, of taste in the anterior two-thirds of the tongue. Kirchner⁷⁴ prefers to the boric acid corrosive sublimate, which he uses during the attack in a 1: 1000 solution; and in the following formula as a prophylactic: R. Mercuric bichloride, 5.05; glycerine, 20.00; water, 30.00.—M. C. S. Turnbull has achieved excellent results in the use of a two per cent. ung. hydrarg. ox. flav. and morphia, conjoined in the early stage with the application of dry heat. Great stress should be laid upon the use of anodynes, the more so if one does not incise. He reports one case in which he produced a traumatic

aneurism of the external carotid by puncturing the vessel when making the incision. In those cases, often mistaken for chronic purulent otitis media, where in consequence of maltreatment or neglect a localized slough of the cartilage takes place, pouring out for months an offensive discharge through a cloaca-like opening situated generally at the junction of the chondral and bony canals, he advises a thorough cauterization (under anaesthesia) by lapis fusa,—the agent being melted on to a silver probe, which had best be bent at right angles near its point.

A clinical lecture by M. Foucher⁷⁷ in the Hôpital Notre Dame, Montreal, has been an important contribution to the subject, as well from a literary as from a medical point of view. He describes with an almost Hippocratic eloquence the appearance of one suffering from this excruciating disorder, and then proceeds to a systematic, concise, and exhaustive treatment of the whole subject with a brilliancy which is quite delightful in the desert of medical lore. We regret that a reproduction of the lecture *in toto* would be foreign to the scope of this work, and to cut it would be mutilation. We must therefore rest content with recording that M. Foucher has not only added to our knowledge, but has put it into better form.

Exostosis.—Removal by chisel has of late received greater favor than by the use of the drill. It is associated with the least danger,⁷⁸ and the growth may be gotten rid of in one sitting.⁷⁹ Field's objection that the chisel is "absolutely useless for ivory exostosis, and nothing but the drill, which makes only a small orifice (quite sufficient for the passage of a sound), is of any service," has to do with a difficulty which can be avoided by attacking the tumor at its base, where the bone is healthy and much softer.⁸⁰ The duration of operation is of no small consideration, Field having taken in one case 50 minutes, and in another an hour and three quarters for the drilling, while the repeated operations in a third case required a total of seven hours under chloroform.⁸⁰ The case in which Hartmann⁸¹ removed in one sitting an ivory exostosis, 14 mm. x 7 x 5 mm., which had filled the whole lumen of the meatus, proves the efficiency of the chisel. In the sessile form Burnett⁸² would endeavor to remove the growth by chiseling off the bone in layers, beginning at the apex of the exostosis; but would aim at once at the point of attachment of a

pediculate growth, and endeavor with a few blows of the chisel to cut through it, detaching the entire mass. In one case he operated successfully with no other anæsthetic than a 5 per cent. solution of cocaine, using a specially devised bone forceps and a chisel. The blades of the former were 2 cm. long, pyramidal in shape, 4 mm. wide at the base on the cutting surface, and 5 mm. wide on the side at right angles to the cutting surface. When brought together the blades form a triangular wedged-shape blade, 1 cm. wide and 5 mm. thick at its base, which permits quite a deep insertion into the auditory meatus. Much diminution in these dimensions would weaken the blade. The chisel was nearly 7 cm. long and 4 mm. wide at the cutting edge.



BURNETT'S EXOSTOSIS FORCEPS.

Schifossovski⁸³ operated in another way. An incision was made behind the auricle, with ligation of the posterior auricular. The integument was prepared away from the periosteum and the growth was removed by bone-forceps.

Désarènes⁸⁴ used the chisel successfully in three cases in which, as might have been expected, iodide of potassium internally and the local application of iodine had failed.

MEMBRANA TYMPANI.

Physiological.—Fick⁸⁵ offers an explanation of the fact that periodic vibrations are better perceived than aperiodic ones. For example, a trumpet tone is relatively to the initial amplitude of vibration, better heard than the discharge of a gun. It would therefore seem that there must be in the mechanism accessory to audition some apparatus with the function of resonance, whereby the periodic vibrations reinforce one another and become accumulative. The ability of the membrana tympani to transmit to the internal ear with almost equal facility tones of any pitch within

the audible limits, does not, as has been generally thought, rest upon its powers of supplementary suppressing secondary tones. On the contrary, it is a resonator for all the notes of the musical scale in like manner to the resonators of stringed instruments,—the violin, piano, etc. This resonance it owes to its peculiar deviation in form from that of a free-stretched membrane. It is not only funnel-shaped, a point upon which Helmholtz has laid great stress, but it is firmly attached along one of its radii to the long handle of the malleus. The membrane may be conceived as composed of an infinite number of strings of varying length and (from torsion of the malleus) of varying tension, stretched from the handle to the periphery and tuned respectively to every possible pitch in the audible scale, each vibrating with its corresponding tone and imparting it to the malleus and by the latter to the stapes and labyrinth.

Noises, on the contrary, produce aperiodic movements, the vibrations neutralizing each other by interference, and as a consequence arriving enfeebled at the stapes. That tones of one pitch are not favored more than another, Fick demonstrated by experiment upon an apparatus constructed in imitation of the membrana tympani. A membrane stretched upon a ring and drawn into funnel-shape by a rod firmly attached to it along one of its radii gave back all tones with approximately their initial (objective) amplitude. Variations in size or tension of the apparatus gave no other result. The membrane itself thrown into vibration resembles a “tam-tam,” in that it produces a noise containing all possible harmonic and inharmonic components, without any regular periodicity in vibration. In the ear, therefore, we have two sorts of resonance apparatus. The first, the tympanum, has for its effect the setting of a point, viz., the end of the manubrium mallei and mediately the stapes in vibration, favoring at the same time tones which have a regular periodicity. The second resonance apparatus in the cochlea has for its effect an analysis of these composite sounds and a distribution of their components to the separate elements adapted to their respective perception.

Myringitis Tuberculosa, so-called.—The investigations of Moos⁸⁶ into the pathological mechanism of chronic purulent myringitis in tuberculous individuals have furnished the following results, which we relate in the language of Dr. Charles Stedman Bull,⁸⁷ whose

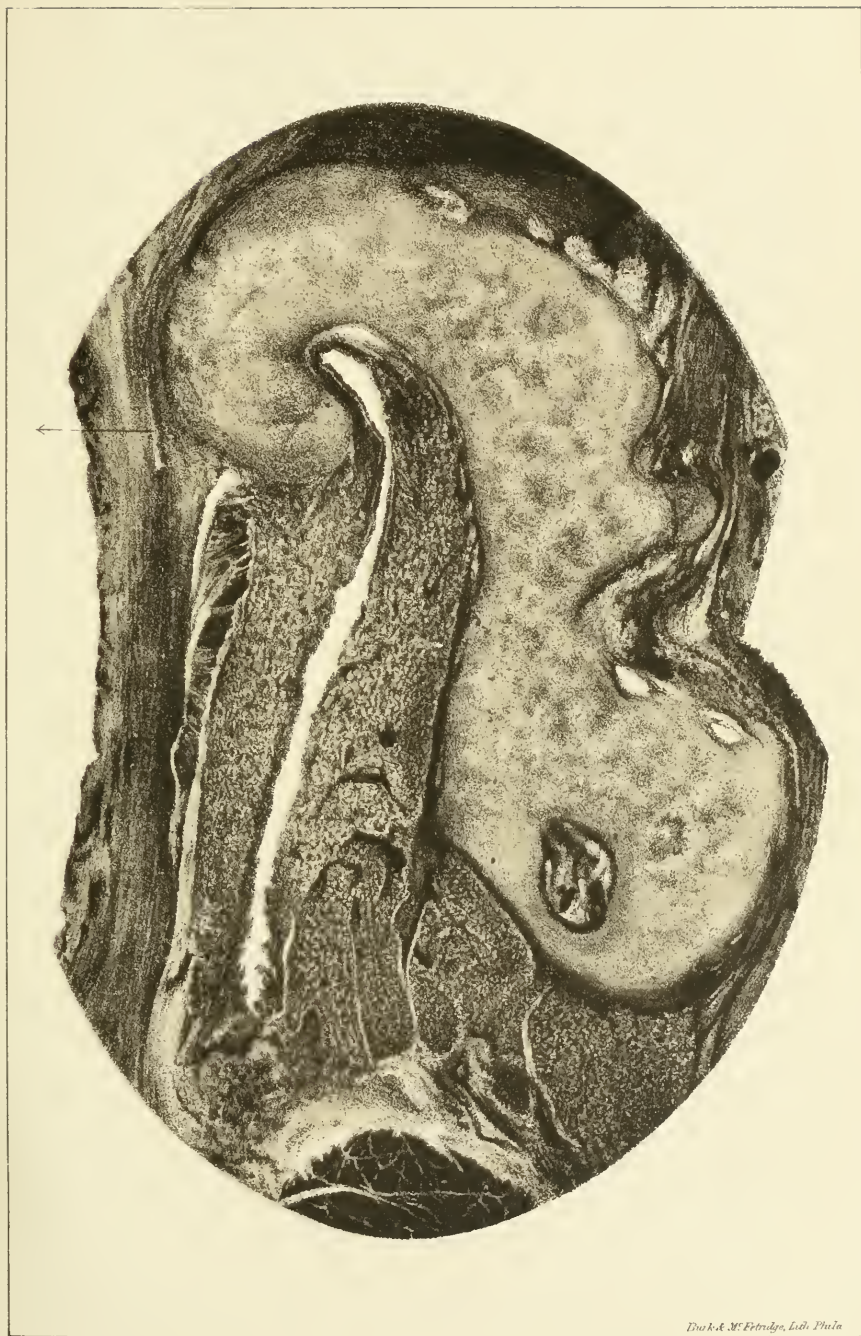
reviews of current otological literature in the *New York Medical Journal* are unsurpassed by similar contributions in any periodical:—

In the Malpighian layer, Moos found irregular hyperplasiæ in the direction of the cuticular layer, and the proliferation also formed true papillæ with loops of blood-vessels between them. These hyperplasiæ sometimes reach as far as the manubrial artery. In the cuticular layer the normal blood-vessels are dilated and gorged with blood corpuscles. There are also numerous newly-formed blood-vessels, especially in the membrana flaccida. The neighborhood of the external wall of the blood-vessels is more or less infiltrated with round cells, and the interstices of the cuticular connective tissue are studded with round, multinuclear and pus-cells. The newly formed connective tissue is the product partly of rounds cells which have been transformed into spindle cells, and partly of the proliferation of the mural elements of the blood-vessels. The inflammatory changes of the cuticular layer extend into the wall of the external auditory canal for several millimetres. Near the handle of the hammer the purulent infiltration is most pronounced, causing destruction not only of the cuticular layer itself, but also of the adjacent periosteal layer of the handle. In consequence of this all the layers of the drum membrane covering the lateral aspect of the handle disappear, leaving the carious bone bare. The inflammatory changes of the mucous membrane and the consequent tissue hyperplasia differ but little from those found in the cuticular layer. As a rule the hyperplasia is most pronounced in the region of the handle and at the inner surface of the ventricular ligament. As regards the changes in the substantia propria, Moos has never been able to find true vascular inflammation of the substantia propria in the myringitis occurring in the tubercular individual. As a rule the substantia propria suffers angular and arched displacements in consequence of the pressure of the enormous mass of exudation. If this pressure increases still more the substantia propria will be ruptured by the forcible displacement of the fibres. Whenever the substantia propria is ruptured hemorrhage takes place. But true hemorrhagic infiltration must be distinguished from the hemorrhagic effusion into the interstices of the cuticular tissue as described above. It may be either circumscribed or diffuse.

EUSTACHIAN TUBE AND TYMPANUM.

Anatomy.—Randall and Morse⁹² call attention to some unnoted points in the anatomy of the Eustachian tube. In their photographs of vertical sections of the structure, they find the relations of the tensor veli palati muscle to the tube much as described by Weber-Liel its three lamini clearly marked. The thin inmost layer of fibers is so nearly parallel to the axis of the tube in its middle third that they are cut almost transversely in the sections, in which the rest of the fibers are longitudinally cut. The middle group of fibers is only moderately developed in their sections and is inserted on the convexity of the lateral portion of the hook cartilage, leaving the tip of the hook—its usual attachment—wholly free. But it is the outer layer of fibers which is most notable. This they find to constitute one half of the bulk of the muscle and to pass upward around the convexity of the cartilage to its insertion or origin upon the fibro-cartilage of the base of the skull. It is joined also by fibers arising from the upper surface of the hook cartilage, which are inserted with it. These last fibers would in their contraction raise and draw outward the hook, thus dilating the upper portion of the lumen of the Eustachian tube; but the main body of fibers of the outer layer could exercise no “dilator” action upon the tube, tending on the contrary rather to compress it. That the motion of the outer layers of the tensor veli are independent of the hook cartilage, is made still further evident by the interposition of a bursal sac, with a synovial lining, between them, a structure which they have been unable to find in one other case among the preparations within their reach. Some of the points are doubtless only individual variations and rarely to be met; but they seem to have sufficient interest, as bearing upon the physiology of the Eustachian tube, to be worthy of note.

In the engravings shown herewith, reproduced from the work of Drs. Morse and Randall, with their kind permission, Fig. 1 shows the entire structure under low power: the “palm-leaf” shape of the hook cartilage; the narrow cleft of the lumen of the tube, broadening above into the safety tube; the glandular structure of its walls; the levator veli palati muscle in transverse section below its floor; and to the left, the fibers of the tensor veli, with their insertions as described. Fig. 2 shows the bursal



Doak & McBridge, Lith. Phila.

Vertical Section of Eustachian Tube. (Figs. 151 and 152.)

Photographic Illustrations of the Anatomy of the Ear

F. Blakiston, Sec. & Co. Phila.

sac and the adjacent structures under higher power. The original illustrations were heliotypes direct from the photomicrographic negatives, and were absolutely free from retouching or sophistication. The same rule was observed in the reproduction of the illustrations for the ANNUAL.

Bath⁹³ has made a valuable contribution to the anatomy of the middle ear:—The ciliated epithelium of the tube is continued along the inner and lateral part of the wall to the edge of the membrana. The inner and lower wall are covered with pavement epithelium (such as is possessed by the membrana itself) in a single layer, as are also the bony walls from about the region of the center of the membrane backward. Pavement epithelium with ciliæ is a cell form belonging only to regions of transition.

In a four months' fœtus there can be found in the upper corner of the tympanic cavity, pavement epithelium in two layers, which also covers the third or the outer wall, to pass thence into a single layer which covers the lower two thirds of the outer wall, and the whole of the inner wall. Upon the floor a limited region possesses pavement epithelium in two layers.

In a fœtus of seven months all that portion posterior to the middle of the membrane bears pavement epithelium without ciliæ. From here to the opening of the tube are the superior, inferior and lateral walls (excepting the membrane) covered with cylinder epithelium in a single layer; while the inner wall possesses the same in the tubal region only, and posteriorly, especially upon the promontory, presents the pavement form. The double layer of the former stage has therefore developed into a single one.

Bath looks upon the diverticula described as the glands of the tympanum as simple crypts, which are cuboid in the region of cuboid epithelium, and ciliated cylinder cells in that of ciliated epithelium. He considers the whole mucosum the secretory organ of the middle ear. The groove-like depressions in the mucous membrane are absent in the fœtus. They first appear with the crowding together of the mucosum. In the fœtus also there is a secretion in the whole tympanic mucous membrane. In the sacculus there are gland-like diverticula, lined with simple columnar epithelium. They correspond to the elevations which occur in the ductus and recessus endolymphaticus, as organs for the secretions of endolymph, like the elevations in the aquæductus.

Diverticulum Tube Eustachii.—Kirschner⁹⁴ found such in the cadaver of a man 50 years of age. It was situated 1.5 mm. from the pharyngeal end, and had a circular opening. Its diameter in the direction of the tubal axis was 8 mm., and it was 6 mm. deep. The mucosum was atrophied. Kirschner looked upon this diverticulum, not as an anomaly of development, but as the product of pathological tissue change in the tube.

Obstruction of the Tube in Diabetic Patients.—Miot,⁹⁵ in reporting a case to the Paris Laryngological and Otological Society, concludes: 1. That a tumefaction with œdema of the tube is a complication of diabetes mellitus; 2. That the ordinary efforts at relief have proved of no avail; 3. That the continuous current so diminishes the contracted condition of the mucous membrane, as to render possible the introduction of bougies, as well as the employment of the chemical galvano-caustic; 4. That the latter increases the lumen of the canal, and seems the most efficient and rapid means of restoring its function.

Chronic Plastic Otitis Media.—The mechanical effects resulting from tympano-salpingian catarrh are obstruction of the Eustachian tube and consequent increased atmospheric pressure upon the drum membrane; and the tendency of long continued inflammation to cause contraction or retraction of the fibrous tissues of the tensor tympani and stapedius muscles, the ligamentum annulare of the oval window, and probably of the membrana tympani secundaria of the round window. These changes affect the hearing to a disastrous degree. The only remedy for these conditions consists in inflations of the tube and middle ear. The anatomical peculiarities of the tympanic cavity and its intolerance of foreign substances, limit the resources at our command. The methods of removing the structures in mechanical error, or the simpler procedure of changing the lines of traction by cicatrices artificially produced, by means of multiple paracentesis, are claiming attention as *derniers ressorts*. The Weber-Liel tenotomy of the tensor tympani generally fails because the changes in chronic inflammation of the middle ear are not confined to that part. In Kessel's radical operation of removing the membrane and hammer, and, to prevent regrowth and secure drainage of the cavity, of removing also the posterior and inferior portion of the annulus with eventual chiseling out of the corresponding portion of the sulcus tympanica,

Baracz⁹⁶ adds to the favorable statistics of Lucae,⁹⁷ Hartmann,⁹⁸ and Schwarze.⁹⁹ The more recent method of multiple paracentesis advanced by Bates¹⁰¹ and Pomeroy¹⁰² (to whose decision we can leave the question of priority) is still *sub judice*. Pomeroy operates as follows: after the induction of local anæsthesia, four or five punctures are made with a Graefe's cataract knife, generally in the posterior superior quadrant, although occasionally in front of the manubrium. If the membrane at point of attempted puncture is in contact with the promontory, the knife will not go through and another spot must be selected. The operation has for its object a diminution by cicatricial contraction of the drum-membrane in area, thus exerting an outward traction on the stapes, which is more or less impacted in the oval window. The successes of Pomeroy will warrant a further trial.

Deafness from Secondary Syphilis.—"In some instances, syphilis apparently causes well marked changes in the middle ear, which alterations have been very erroneously referred to the nerve structures of the internal ear, especially to the cochlea. There are many more reasons for placing these apparently syphilitic changes in the tissues of the middle ear, the conductive functions of which we are acquainted, and the labyrinthine and nervous structures, of the mechanism of which, physiologists know nothing positive." So says C. H. Burnett. Sexton tells us that "it may be surmised that granuloma or circumscribed, small, round cell infiltration takes place within the tympanum; that the invasion is rapid and that it prevents, by fixation, the conductive apparatus from its normal movements." In support of these theses, S. L. Phillips,¹⁰³ of Savannah, reports the following case: The patient six weeks after the healing of an initial lesion, had a general paralysis (so he says), from which he promptly recovered. One week after the onset of the palsy, he had severe pain in the head, with nocturnal exacerbation. At this time he suddenly became deaf, but at no time was there pain in the ear. Shortly thereafter, there was facial paralysis on the left side, involving the buccinator, orbicularis oris and palpebrarum, and apparently all the muscles of expression. The tongue did not deviate on protrusion, nor was there paralysis of the uvula. Taste was intact. The hearing of the watch was reduced to 2 1-2 inches on the right side, and 1 1-2 on the left. The canal showed no redness, as mentioned by Bumstead and Sexton in syphilitic ear

troubles, nor did they appear in any other way abnormal. The membranes were somewhat contracted, especially on the left side, with small reflexes. The opacity was that of the "ground glass" order. Injection was noted along the left manubrium. Inflation by the air-douche was easy of accomplishment. A tuning-fork from the vertex was perceived equally well in both ears; and if either meatus were closed, it was heard better upon that side. Throat symptoms were negative and the cervical glands were not involved. Under full specific treatment, and the daily use of the Eustachian catheter, he continued to improve until the hearing increased to 10 inches on the right side and 5 1-2 inches on the left, when he passed from under observation. Phillips would lay great stress upon the fact that exclusion of labyrinthine error is rendered possible by Weber's test; and that the middle ear trouble (for such he is warranted in concluding it to be) is not by extension from the pharynx or external auditory canal. With facial paralysis there is undoubtedly a suspended action of the tensor tympani sufficient to cause deafness, but such would not account for all the aural phenomena.

Otitis Media Hemorrhagica.—Of this rare affection Roosa mentions only two cases, and Burnett makes but a passing allusion to it. Bullel,¹⁰⁴ of Bombay, adds the following case to the limited literature of the subject: A woman of 42 was attacked with an acute pain in the left ear, intermittent for the first ten days and confined to the ear only. For the last two days it had been acute and constant, and radiating over the entire left side of the head and face. Mastication and deglutition increased the suffering, which was occasionally paroxysmal, and accompanied by pyrexia, restlessness and insomnia. The naso-pharynx and left tympanic membrane were congested, and the right membrane slightly indrawn. Paracentesis was performed, when about two drachms of blood gushed through the puncture in the membrane and the side of the nose. Relief was immediate, and recovery complete in about a week. Not a drop of blood or muco-pus escaped through the puncture afterwards, the wound healing up in five days.

A case of hemorrhagic otitis preceded by paraplegia is related by Dewèvre¹⁰⁵ in which intense pain was the first aural symptom. The discharge, at first red, became sero-sanguinolent, then purulent; the mucous membrane of the tympanic cavity became in-

tensely congested, the mastoid region red and œdematous but not swollen. There was also epistaxis. The patient recovered, but with impaired hearing. Dewèvre calls attention to the occurrence of this affection in Bright's disease, cases having been recorded by Rayer, Lecorché, Fournier, Rosenstein, Dieulafoy, Trautmann, Auvert, Alibert and Domergue.

Diphtheritic Otitis Media.—Barclay,¹⁰⁶ in an exhaustive paper, sets forth the progress of doctrine on this important subject, and gives a very complete bibliography. The consideration of labyrinthine diphtheria we shall consider in its appropriate section. Barclay concludes his valuable paper by saying that aural diphtheria is very insidious, usually comparatively painless, showing a uniform and marked tendency to become chronic in form, and to produce rapid and widespread destruction, with necrosis and burrowing into neighboring parts. Among its probable effects he includes fetid discharges, often persistent, always annoying and disgusting; deafness, erosion of the Eustachian tube, mastoid perforation, partial or facial paralysis (Bell's palsy), meningitis, thrombosis, phlebitis, pyæmia, cerebral abscess and death. In view of the insidious development of the affection, he advises early and frequent examination of the ear in every case of diphtheria; and though the patient complain of no pain or discomfort, should an inflamed and bulging condition of the drum-head be found, an incision should be made in it large enough to permit the escape of inflammatory products, removing them by artificial means if necessary, to check the burrowing into neighboring regions. Syringing of the fauces and nares, vigorously recommended for cases of diphtheria with prominent naso-pharyngeal manifestations, should be cautiously practiced, lest *materies morbi* be forced into the Eustachian tube or the middle ear. Whatever or wherever the local phenomena, close attention should be given to the constitutional condition of the patient, and in modifying and adapting local measures for management of an aural diphtheria, free drainage, cleanliness and antisepsis should be aimed at.

Otorrhœa.—Little new has recently appeared upon this subject, but so wide-spread are popular misapprehensions concerning the nature and management of this disorder, that numerous writers of the year have felt constrained to reiterate, for a thousandth time, the most fundamental doctrines.

In the first place, the term is narrowed in definition. Correctly it is no longer applied to a discharge having origin in the external ear. An otitis externa—follicular, parasitic, eczematous, bullous and hemorrhagic or syphilitic—is not an otorrhœa. The term is applied always and exclusively to a discharge having origin in the middle ear, and poured out through a perforation in the membrana tympani. Certain perforations are not easy of discovery—particularly those in the membrane of Shrapnell—and in the case of children this difficulty is augmented by that of the exploration itself in a canal that is mobile and narrow. The fluid in question may exhibit any stage of transition, from mucus or from serum to pus; and may vary further in character:—may be fetid from suppuration, sanguinolent in case of polyp or exuberant granulations, or ichorous or sanious from that of caries; and may contain the products of retention, decomposition or desquamation in the form of caseous (tuberculous) cholesteomatous and epithelial masses, which are the expressions of different pathological states in the middle ear. It appears a work of supererogation to show that an otorrhœa should be abated; but many are still tenacious of the belief that some solidistic metastasis, or some humeralistic accumulation of impurity in the blood, would take place if this vent were closed. Colladon,¹⁰⁷ in a brilliant lecture, finds the theme too hackneyed for instruction, but urgent enough for exhortation: “The constant menace to life by caries and consequent meningitis, cerebral abscess, phlebitis of the sinuses, erosion of the internal carotid, pyæmia, etc., the exhaustion from prolonged suppuration, the fetid odor which the patient carries with him; in children above all, the erythema and eczema of the neighboring parts, the tinnitus, the deafness, the impossibility of applying an artificial membrane until the secretion has ceased, and finally the refusal of insurance companies to assume such a risk, or else the high rates they impose, are all reasons militating in favor of a prompt and speedy suppression of the otorrhœa.”

In the treatment of this disorder, the constitutional deterioration is combated in accordance with the nature of the case. The local management is twofold: First, the cavity must be emptied and kept clear of all secretions. If the perforation is insufficient for drainage, it can be enlarged or a new one can be made. Never was the command, “*ubi pus, ibi evacua*,” more imperative. But

a simple opening is not sufficient: the fluid must be driven out by the air-douche, or laboriously and delicately removed by absorbent cotton. The Valvulian procedure is the most efficient, because it is the only one which can be carried out by the patient himself, and with the needed frequency. No child can be successfully quit of his otorrhœa until he has been taught to blow his nose. Injections should be bland, warm and antiseptic, and should be used by the physician only, and that with great precaution. To clear the tympanic cavity, or even the mastoid cells, of purulent or steatomatous contents, Erskine¹⁰⁸ finds Hartmann's little tympanic metal tube very useful, particularly in perforations of Shrapnell's membrane. High authorities condemn the injections altogether, or use them rarely and for no other purpose than the removal of insoluble masses, and then they remove the water as carefully as they have removed the pus. The editors make an invariable practice of removing such masses by means of the forceps under a strong illumination.

2. The second objective point in the treatment is to modify the morbid process by local medication, or by operative procedure. We shall consider seriatim such agents and methods as have had part in the discussions of the year. In purulent otorrhœa we find the bacteria of suppuration and putrefaction, and sometimes the specific germ of tuberculosis, etc.; and here, too, as elsewhere in antiseptic surgery, the strife is *aliunde*: concerning rival agents, and not concerning respective indications. The list of alleged antiseptics includes corrosive sublimate, lactic, boric, salicylic and carbolic acids, iodoform and iodol, salol, thymol and hydrogen dioxide.

Ferguson¹⁰⁹ replaces a weak solution of carbolic acid (1:100), which is not antiseptic, and destroys no germs, with a strong solution of corrosive sublimate (1:2000), which is caustic and destroys the epithelium. As to results, it need only be mentioned that they warranted a return to carbolic acid.

Many voices, above them all Schwartze's, have latterly been raised against the powder treatment in general, and in particular against that of boric acid, in middle ear suppurations as tending to confine fluids that should be drained away. Especially would Schwartze caution against this procedure in the upper part of the drum, above all in that of Shrapnell's membrane; saying that the

result would be secondary inflammations of the mastoid process, with all their dire consequences. Erskine¹⁰⁸ considers the dry method of treatment to be of limited application, and pronounces the packing of the meatus with boric acid powder a dangerous procedure, to which no one should ever resort. Bishop¹¹⁰ expresses himself emphatically when he says that a thorough packing will stop the discharge from the ear as effectually as a stopper will suspend the flow from a bottle, so that the contents will not escape. He would insufflate barely enough to cover the membrane, and would thus accomplish all that can be expected from the labyrinth; and the functions of the ear would not be materially interfered with,—an important consideration in many cases. Bezold¹¹¹ gives a double answer to these objections:—(1) that his original cautions and limitations¹¹² have not always been observed; (2) that his statistics are all favorable to the procedure. As to the utility of boric acid itself, all are agreed, although Schwartz still prefers caustic applications. The remedy may not be indicated in every suppuration of the tympanum, but finds contra-indications only in idiosyncrasy of the meatus, some subjects being prone to furunculosis, and some to a peculiar form dermatitis. As to packing, the discussion often reveals an *ignoratio elenchi*: Bezold aims at aseptic surgery and would keep out the germs; his opponents aim at antiseptic surgery, and fear the consequences of confining the germs already in the cavity by a procedure which does not destroy them. The principles which in general surgery control a choice between open and closed dressings will here apply. It should, however, be borne in mind that the tympanum is never closed to infectious germs if the Eustachian tube remains patulous,—a consideration which limits the application of the procedure. As evidence that the packing is sufficient to prevent the entrance of external influences, Bezold¹¹¹ advances the fact of clinical experience, that when in acute purulent otitis media the boric acid is applied directly after paracentesis or spontaneous perforation, no complicating phenomena are apt to arise. Not even with perforation high up, especially in Schrapnell's membrane, did he observe ill results, if it be resorted to early and well carried out. That there is a tendency to confine the secretion to the production of secondary disorders, he would disprove by the statistical fact that in the years 1881–3, 227 acute and 623 chronic cases were thus

treated with a total of but 6 deaths,—a percentage comparing favorably with that of any other method; and frequently has he observed that the removal of fluid is favored, rather than hindered, by the contact of such a porous mass upon the membrana tympani. It has been the practice of the editors to pack the ear only when the discharge has become scanty, and when it possesses that peculiar odor known to the disciples of Abbé Sicard as the “deaf and dumb” odor, and which speaks for the presence of putrefactive rather than of pathogenetic organisms; and to do so then only after a most rigid cleansing, disinfection and drying. But the method is not essential, and to abandon it altogether, with Schwartze, would be better than an indiscriminate packing in every case of discharge from the ear, from myringal abscess and otitis media to furunculosis and eczema, and that without reference to the questions of drainage and disinfection.

Salicylic acid has found little favor, being something of an irritant. Nevertheless Colladon¹⁰⁷ has used it in solution by instillation with considerable success.

Lactic acid, which has proved useful in tubercular ulceration of the larynx has been employed by Baratoux,¹¹³ either pure or in 10 to 20 per cent. solutions in cases of granulation and caries. He has had excellent success in this class of cases. Aysaguers¹¹³ has had negative results in laryngeal applications, but gratifying success in those of the ear.

One could hardly expect so young a science as otology to be entirely free from the fetish of phenol-worship, and we still hear a 1 to 2 per cent. solution of carbolic acid mentioned as antiseptic. This agent in such dilution, has many valuable properties, but it is not a germicide. It is anæsthetic, has an odor preferable to that of fetid otorrhœa, and the water is as useful mechanically as any other fluid for dislodging such insoluble masses as the operator has not the skill to remove with the forceps. The stronger phenol-glycerine solution of Hartmann in beginning acute otitis media meets other indications, but has no place in the treatment of otorrhœa.

The experiments of Heyn and Rovsing¹¹⁴ show that iodoform while it remains in a dry state, is inert in the presence of bacteria, but de Ruyter¹¹⁵ has proved that it undergoes chemical decomposition in the presence of a fluid of a suppurating surface: that is to say, iodoform acts not upon the surface at all, but free iodine is

eliminated as rapidly as may be needed to destroy pyogenic organisms and thus limits or suspends suppuration. Bezold¹¹¹ recommends its use in the place of boric acid in cases where the latter cannot be borne, and toward the close of the treatment when the secretion has become very slight, and the patient can be seldom seen.

Iodol was first used in 1885 as an antiseptic in the surgical wards at Heidelberg,¹¹⁶ afterward in the clinic for syphilis at Rome¹¹⁷ and elsewhere. According to Schmidt, the absence of odor, and the lessened danger of local irritation and systemic intoxication are points of advantage over iodoform. Since November, 1885, Stetter¹¹⁸ has endeavored to substitute it for the latter agent in aural therapeutics, particularly in purulent otitis media. He uses the powder once or twice daily by insufflation, after a thorough cleansing and drying, and finds that it has almost the same action as iodoform. In acute affections the amelioration and recovery are rapid, but in chronic disorders, the results are much less favorable. Schwartze¹¹⁹ employed it in solution after the formula of Mazzoni (2 grammes dissolved in a mixture of 15 parts alcohol and 34 parts glycerin). In otorrhœa complication with caries, tampons of gauze saturated with this solution were placed upon the diseased bone after a thorough cleansing, and were renewed once or twice daily. The results were not unfavorable. There was from the first a disappearance of the odor and a diminution in discharge; but the formation of healthy granulations seemed in no way hastened; and Schwartze prefers the repeated applications of the galvano-cautery. Goris¹²⁰ and Pujesz¹²¹ report favorable results, but Burnett¹²² does not think that iodol has much of a future in otology.

No literature upon the use of salol has as yet appeared; but the agent has been used as a substitute for boric acid in the Hamburg clinic and by the editors. No points of superiority to boric acid were noticed. It should be used in as fine a powder as can be obtained.

Thymol is too irritating to use as an antiseptic. It finds of course, no place in the dry treatment; and is useful only as a stimulant in atrophic cases.

One of the most powerful and yet harmless antiseptics is biniodide of oxygen. The favorable reports of Dayton¹²³ as to success in its use, are supplemented by those of Cheatham,¹²⁴ and Bishop.¹¹⁰ The latter finds it valuable for cleansing the ear when

there is a large amount of débris present in the form of pus mixed with epithelial scales or cheesy concretions. In addition to its excellent mechanical effect, due to effervescence, the oxygen liberated destroys bacteria. Especially is it useful in managing the débris after the destruction of polypi and exuberant granulation. It is used in 10 to 12 per cent. solution by instillation once or twice a day, and in a one per cent. solution as a nasal spray in cases of ozæna with aural involvement.

A last resort in the treatment of otorrhœa is the excision of the membrana tympani and ossicles. We shall quote the discussion of this procedure from an unsigned article in the *Medical News*,¹²⁵ and from the transactions of the American Otological Society. "Since the time of Valsalva it has been known that loss of the membrana tympani and ossicles, except the foot-plate of the stapes, does not cause complete deafness, but at most hardness of hearing. Nevertheless, an erroneous impression has gained a hold in the minds of physicians and the laity, that loss of the membrana tympani necessitates loss of hearing. The first endeavors to excise the membrana partially, with the view of aiding the hearing, date from the beginning of this century, and were made by Karl Hilly and Sir Astley Cooper. Similar trials were made by Deleau, Fabrizi and Brunner (1841) and by Bonnafont as late as 1860. But their instruments and their operations were clumsy and rough and their results very unsatisfactory. Their aim was to make and maintain an opening in the membrana, rather than to excise either it or the ossicula, but all alike failed to make a permanent opening. Wreden then proposed to resect part of the handle of the hammer, hoping thus to prevent entire healing of the opening in the membrana; but this method failed in its object, as all others had. This was especially disappointing, as in most cases the hearing improved so long as the opening in the membrana was maintained. Then came a variety of suggestions as to ways of making a permanent opening in the drum-membrane, as for example, by means of iodide of mercury, sulphuric acid and the galvano-cautery. But the opening thus made would always close as soon as all the symptoms of acute inflammation had subsided. The operation for making a permanent opening in the drum, in order to improve the hearing, was then given up. The fact that in purulent processes the hammer and the incus can be thrown

off without a very high degree of hardness of hearing as a result, led to the idea that obstructions in the sound-conducting parts of the tympanic cavity, lying to the outward of the stapes, and caused chiefly by immobility of the hammer and the anvil, could be removed by excision of the ossicles. Schwartze performed excision of the membrana and extraction of the entire hammer, for relief of sclerosis, in 1873. The temporary improvement in hearing disappeared as soon as the imperfectly excised membrane had formed again. Lucae, of Berlin, seems to have performed a similar operation in a number of cases, but his results are not fully published. Kessel, of Prague, has suggested that to prevent a regrowth of the membrana tympani, the annulus cartilaginous, in the posterior circumference of the membrana, be removed, and eventually a resection of a portion of the sulcus tympanicus be performed by means of a chisel. In 1886, Sexton, of New York, presented a paper before the American Otological Society, on a "New operation for the radical cure of chronic purulent inflammation of the middle ear tract." This operation has been performed by him nineteen times within the past year and a quarter, with very satisfactory results as to the cure of the chronic otorrhœa, and improvement in hearing in many cases, although the operation was not undertaken for the attainment of the latter result.

Dr. Sexton suggests this procedure for those hopeless cases of otorrhœa where the conducting apparatus is crippled, and the remnant of Schrapnell's membrane becoming inverted, helps to form a pouch for the retention of pus and debris. By this operation the passage outward from the tympanic cavity is cleared permanently. The first step in the operation is to separate Schrapnell's membrane from the auditory plate and remove the membrana vibrans from the auditory ring. If the malleus and incus are in situ, divide the tendon of the tensor tympani. The chorda tympani nerve is divided where it enters the tympanic pyramid, and at its exit into the canal of Hugnier. The long process of the malleus is to be divided detached from the glenoid fissure. The freed tissues and bones are now removed with the forceps. Often the incus becomes displaced, and must then be removed with the attic scraper. Polypi and granulations are to be cut away with the scraper. They sometimes cause troublesome bleeding, and it is better to give them preparatory treatment,

The disturbance to taste from the division of the chorda tympani gradually disappears.

Aural Polypi.—Since the exhaustive papers of Grüber, and Steinbrügge and Moss, little new has appeared under this head. Of the pathological elements in such growths, Briggs¹²⁷ offers an admirable summary of the subject. He believes (we use his own language) that “there is nothing peculiar in the nature of their origin, which is usually a suppurative inflammation. Histologically they are primarily the same as wound granulations, except that occasionally they exhibit an epithelium which adds much to the growth. In the older polypi we find a mixture of granulation and mature connective tissue, the latter increasing with the age of the polypus. Even in the oldest there are large clumps and clusters of round cells, particularly in the periphery. Sometimes a foreign body is present, if there be suppuration, and a plug of cerumen is sometimes found pressed deeply down against the drum membrane. He believes it to be an admitted clinical fact that primarily polypi are simply granulation tissue tumors. Spontaneous involution sometimes takes place when the cause of the growth is removed, while spontaneous exfoliation from accidental rupture of the pedicle, or the use of the syringe, is a fact of common observation. The many accidents to which polypi are liable account for the limited number of large ones. Even in minute polypi the microscope reveals partial degeneration of the tissue and extensive alterations in the blood-vessels with which they are supplied. The main histological characteristics of these polypi is the preponderance of granulation tissue, large round cells with large nuclei and numerous nucleoli lying within a delicate alveolar framework. These cells are packed closely together with but little intermediate tissue. The older polypi exhibit regular rows of similar nuclei, with spindle-shaped cells and more or less fibro-cellular structure. The transformation of connective tissue begins in the axis of the tumor, in the root first, and extends outward. The outer layers of young polypi show smaller round cells lying together in pairs or triplets, or even in larger numbers, or else large ovoid elongated cells, constricted in the middle, suggesting the peripheral growth of the polypus by segmentation of cells. Close to these normal cells, however, the tissue is often found in a very degenerated condition. Among the many changes to which polypi are

liable, we observe a more or less extensive œdema and increase of the intermediate substance, a dusky-like opacity of the same tissue, and myxomatous degeneration. The nuclei themselves are swollen to such a degree and are so opaque that the nucleoli are no longer to be seen. Besides, we sometimes find hæmorrhagic infarction with its sequences, in which the alveolar framework is still preserved and filled with red corpuscles or deposits of pigment cells, which in this case are mostly taken up by the round cells. Giant cells are also frequently visible amidst incipient degenerative changes like these. The cause of all these occurrences is to be sought for in the blood-vessels, which in the youngest polypi form a thick net-work of capillaries, precisely as in simple granulations. The vessels are sometimes filled with thrombi, and in some cases the polypi consist almost entirely of vessels and cavernous spaces (angioma). About one half of all aural polypi possess an epithelium. This of course refers to the cases examined, and at the time examined, as previous changes from accidental causes may have destroyed the epithelium. The polypi which spring from the cuticular layer of the meatus are characterized by the long palisade-shaped processes of the rete Malpighi sinking deeply into the fundamental tissue, as well as by the broad band-shaped fibres of the tunica propria, as von Trolsch first described them. The treatment of aural polypi is a matter of no little importance when we consider that such cases yearly form a few additions to our post-mortem book. The plate of bone which separates the tympanum from the dura-mater is never very thick, and sometimes extremely thin. The mastoid cells have venous communication with the portion of bone which forms the sulcus in which is the lateral sinus, so that it is surprising that where there is a perforation of the tympanic membrane, death does not result more frequently. In fatal cases of this kind it is more usual than not to find the temporal bone carious."

In the treatment of polypi, Purjesz¹²⁹ advocates the use of alcohol as a something new, while Schulte⁷⁶ warns against such a procedure. Gomperz¹³⁰ resorts to electrolysis as an escharotic, and Whitell¹³¹ uses a paste of arsenious acid and creosote which he finds to be painless and to prevent recurrence; while Barclay¹²⁸ considers searching escharotics dangerous, and where the snare is insufficient, relies upon the curette and alcohol. Camp¹³² employs

acchrom. exsiccatum. The procedure of Briggs¹²⁷ has the merit of simplicity, safety and efficiency. After a thorough cleansing and disinfection, he packs the canal with tannin, which he allows to remain 12 hours. Disintegration of the older polypi generally takes place in this time. The debris is treated with hydrogen binocide, which gives place to boric acid, when all morbid growths have disappeared. In amputation by the snare, Auriol¹³³ offers a manœuvre for overcoming the difficulty in reaching the base. He draws the tumor into a glass tube by a piston or any other means of suction, until the end of the tube rests upon the point of attachment. The loop of a snare is then run over the tube to the end of the tube and the growth is cut off short. He treats the surface with chromic acid and continues the daily instillation of chloral in 5 per cent. solution a number of days.

EAR DISEASE AND BRAIN SUPPURATION.

On the surgical treatment of brain suppuration following ear disease much might be written, because we are now in a position to advise, and secured by recently developed facts and experience, can lift the curtain to reveal that which has heretofore been considered almost the region of the great unknown. C. H. Burnett¹³⁵ in a recent review records salient points of an article on this subject by R. F. Weir. He commences with a case of purulent disease of the ear, in a woman 39 years old, in which the mastoid was operated on. The subsequent cerebral symptoms pointed toward an abscess in the brain. Therefore the original mastoid perforation was enlarged by half an inch (it had been made just where the mastoid glides into the external canal), and deepened until the dura-mater was exposed nearly the size of a finger nail. Cutting through this membrane, a hypodermatic needle was introduced to a depth of nearly an inch and a half, being directed along the upper part of the petrous bone, and also into the cerebral lobe in this region. No result was obtained by this operation, nothing but a little blood being extracted. Eleven days afterward the patient became hemiplegic on the side of the affected ear, with a temperature of 103°, an irregular pulse of 68, and vomiting. Under these discouraging circumstances, a further ineffectual attempt was made to relieve the patient. With a one-inch trephine a button of bone was removed over the left Rolanderic line, the

dura-mater incised crucially, and about two ounces of clear cerebro-spinal fluid let out. Six exploratory punctures were then made with an aspirator, but nothing was detected. The patient died next day, comatose. An autopsy was refused.

He states that the situation of an abscess in the brain depends to some extent upon the route by which the inflammation extends from the ear cavity, "the condition of long tarrying pus, however, being by far the most important of all factors in the self-infection." The important surgical fact, however, comes out strongly from numerous observations that a majority of the purulent deposits in the brain from ear disease are encountered in the temporo-sphenoidal globe, and that after this the most affected locality is the cerebellum. It should also be borne in mind that both of these regions are fortunately of less value to life, and can better tolerate surgical interference than almost any other portions of the brain. "It is owing to the fact of their slight motor importance that our power of localizing tumors and abscesses in these regions is so poor; and this consideration leads directly to the remark that the earliest decided evidence of brain-pressure in the disease under question should be acted upon as soon as detected, since their development presupposes an already large accumulation of pus." Surgical interference with the brain is therefore advised as soon as a mastoid operation has shown itself to be impotent to relieve the symptoms. In this connection it is well to recall the fact that one-fifth of the cases of cerebral abscess die unrelieved by the mastoid operation. The relief sometimes observed after the latter, either with or without finding pus, is explained by the supposition that either the cerebral abscess itself has been drained by the operation, or, what is more likely, that an extra-dural collection has been let out by the mastoid opening. In view of these considerations, Weir believes that, anatomically and surgically, no reasons exist adverse to an early opening of the dura, and draining the fossa in cases of suppurative meningitis of the middle fossa due to aural disease. When symptoms are present by which the probable site of the purulent collection can be located, whether in the temporo-sphenoidal lobe or in the cerebellum, the surgeon will be guided largely by the neurologist. The cerebellar region is not regarded as inaccessible to surgical treatment, and therefore the advice is given that if the cerebral abscess can be excluded in favor

of an abscess in the cerebellum, there should be no hesitation in operating below the temporium through the occiput. The guide in operating on the cerebellum given by Barker¹³⁶ should be remembered, *i.e.*, the region of the foramen of the mastoid vein. This point is always examined by Barker before examining the skull in cases of intercranial suppuration, because it is plain that "if there be inflammation of the posterior aspect of the petrous bone, it can hardly reach the cerebellum without forming a layer of pus under the dura-mater of the lateral sinus. If this is so, the pus will escape by the mastoid foramen if the latter be exposed."

Barr,¹³⁷ in writing upon abscess of the brain resulting from disease of the ear, cites the cases of Trükenbrod,¹³⁸ Schondorff,¹³⁹ and Sutphen,¹⁴⁰ and concludes by approving of the plan of Macewen¹⁴¹ (not forgetting Greenfield's¹⁴¹⁻⁶⁷ successful case), which is, when the abscess is found, to make another opening lower down, nearly on a level with the floor of the middle fossa of the skull. If a current of fluid can be made to pass from the upper to the lower opening, thorough cleansing would be insured. He is not sure of the desirability of always opening the mastoid; and McBride and Miller¹⁴² give the weight of their evidence in favor of the roof of the tympanum as the seat of operation. The paper just referred to, with remarks by Annandale,¹⁴² Greenfield,¹⁴² Bramwell,¹⁴² Caird,¹⁴² Chiene,¹⁴² and Hughes-Bennett,¹⁴² must be read in the original to be appreciated. An exceedingly interesting point is made by Bramwell in referring to cases of suspected abscess of the left temporo-sphenoidal lobe. He says that "word-deafness" should be looked for. A lesion in this part of the brain might be suspected to give rise to this symptom, which at present would be of importance, both as indicating the presence of an abscess as distinct from meningitis, and as a guide to the position of abscess, and therefore to the place of the operation. McBride thinks the question an interesting one. He could not recall a case, though he believed the temporo-sphenoidal lobe was the part oftenest affected.

James Black¹⁴³ reports a successful operation in which, after a suppurative otitis media he perforated the mastoid and trephined the temporo-sphenoidal lobe. In referring to surgical treatment of abscess of the brain resulting from disease of the ear, Barr's¹³⁷ concluding remarks are significant: "It is quite clear that in the

future persons suffering from abscess of the brain dependent upon ear disease, should not be left to die, as they have been in the past, without an effort being made, by opening the interior of the cranium, to reach the brain and drain the abscess. How this can best be done can not be fully settled until further experience has been gained;" and C. H. Burnett¹³⁵ quotes the following as well worthy of attention: "When every member of our profession is sufficiently impressed with the importance of chronic suppurative inflammation of the middle ear, and prepared efficiently to treat this disease in all its stages, the occasion for this operation will probably seldom arise."

DIPHThERIA OF THE EAR.

In the course of diphtheria there not infrequently occur cases of severe deafness whose peculiarities point apodictically to the labyrinth as the seat of disease; and although this has long been a matter of clinical observation, its study has only recently been transferred to the laboratory, where the investigations of Moos have dispelled much of the obscurity which had veiled it. The subjects for investigation were the six temporal bones (petrous portions) of three children who had died of diphtheria; and the microscopical preparations demonstrated a direct migration of a pathogenic organism not only into the tissue of the membranous and bony labyrinth, but also into the whole petrous pyramid. The pathological changes which he noted were as follow:—

As had been clearly demonstrated by other observers in the diphtheritic process elsewhere in the body, there was also here an exquisite "gloar stasis" in the blood-vessels, especially in the distribution of the arteria auditiva interna, and a frequently demonstrable rupture in consequence of the vascular necrosis characteristic of this disease. The consecutive hæmorrhage could be traced on the one hand into the peritoneum of the lamina spiralis ossia of the first turn of the cochlea (with a pouring of blood into the scala tympani), and on the other hand into the periosteum of the vestibule and as far as the crests. This vascular necrosis with extravasation produced in the main nervous trunks an extensive tissue necrosis, whence occurred the oft seen defects in the acoustics and its distribution. It represents a later stage of the hæmorrhagic infiltration, which was first observed in diphtheria

by Buhl¹⁴⁴ in the spinal nerves and intervertebral ganglia, and it is to be distinguished from the parenchymatous neuritis of Mendel and Meyer, in which are found disruption of the axis-cylinder, proliferation of nuclei in the substance of Schwann, and total destruction and fatty metamorphosis of the nerve fibres. In the remaining portions of the pyramid there were not only necrobiotic appearances, but also those of new formation, and not seldom were seen the two processes in juxtaposition. In the Haversian canals and neighboring medullary spaces was a cellular infiltration; not seldom was the lining membrane hyperplastic, while in the medullary spaces themselves the marrow exhibited decomposition and the products of retrograde metamorphosis.

Of micro-organisms, no bacilli (Klebs) could be discovered. Streptococci were everywhere found in the medullary spaces of the pyramid, as might be expected, inasmuch as the bony medulla is, next after the liver and spleen, a site of predilection for pathogenic micro-organisms. In the endolymphatic spaces of the semicircular canals and in the frontal ampullæ they were found each in but one case. In the perilymphatic spaces of the semicircular canals they were sparingly present in two pyramids, and once in that of a frontal ampulla. The result was negative in each vestibule and cochlea. In fact, the latter but once exhibited any pathological change (hæmorrhage into the scala tympani, collection of lymph and large round cells in the sulcus spiralis and ductus cochlearis of the same); and it was negative, furthermore, in the described defects in the acousticus and its distribution, except in one case. On the contrary, it was positive in the aquæductus vestibuli and in the described defects in the proliferating and partially disorganized periosteum of the petrous portions.

This examination by our present technic leaves many gaps in the induction to be filled; but Moos still claims that the results obtained fulfill the greater portion of Koch's (p. 24) postulate: "Whenever bacteria [the same is valid for other micro-organisms in the interior of an organ, be it in the blood or lymph vessels or in the tissue itself] are met in positions such as could only be possible in the living body; or if, indeed, an unmistakable influence of the micro-organism upon the invaded tissue can be demonstrated,—*e.g.*, cellular necrosis in a certain limited territory with accumulation of round cells in the immediate neighborhood and penetration of

foreign organisms into the cells,—then it is that we may look upon such organisms as pathogenic.” That the streptococci which have thus invaded the labyrinth are the specific germs of diphtheria Moos would not claim. He considers them rather secondary.

The genesis of the endolymphatic appearances is as follows: The spaces have no blood-vessels and the endolymph processes for morphological elements only the lymph-corpuscles, and is a clean semifluid which separates upon standing into small gelatinous lumps and a thin fluid. What now happens when micro-organisms invade a space filled with such a fluid? The first event is purely a mechanical one: a part of the fluid coagulates. This is no mere assumption. It is taught by simple inspection. Upon the endothelial layer of the membranous semicircular canal—sometimes in the centre of the canal, sometimes upon a papilla or on a spot free from papillæ—is seen a collection of lymph cells enclosed in a gelatinous coagulum, which is attached by fibrinous threads to two or three endothelial cells. These latter become spindle-shaped and form a pedicle to the endolymphatic cellular mass. This process may repeat itself until the whole space is filled. [There may be, and likely are, other changes taking place in the epithelium (endothelium), but none were observed.] In the preparations, layer after layer could be distinguished where coagulation of endolymph had enclosed the lymph cells. That further changes take place, division and proliferation of the nuclei through the further invasion and formative irritation of micro-organisms is altogether probable.

The changes in the perilymphatic spaces are somewhat more complicated: (1) The same occurrences take place in the perilymph as in the endolymph. (2) The endothelial cells of the periosteum and of the ligamenta labyrinthi undergo change, and that in opposite directions. Irritation may produce a cellular infiltration of the ligament with resulting hyperplasia, so that the hyperplastic ligamentous tissue may invade the lumen of the bony semicircular canals, causing bends in the bone, and deformity; and when periosteum thus encroaches upon a cell mass in the endolymphatic space, it brings about an early ossification. Or the endothelial cells of the ligamenta labyrinthi suffer necrobiosis, and the ligament is reduced to thin structureless, often shortened and knotted, threads atrophied or altogether absent. (3) Finally,

there is to be added a necrosis of the bony semicircular canals, which is not the product of a purulent inflammation, but is primary process brought about by global stasis and thrombosis of the smaller periosteal vessels, and finally of the wreck of the vessel itself. The paradoxical juxtaposition of such contradictory processes as necrosis and new-formation is only another example how differently the war between cell and bacterium may terminate.

How do these organisms get into the petrous portion of the temporal bone and the labyrinth? For the Haversian canals and medullary and perilymphatic spaces, the answer is easy. They enter the general circulation through the lymphatic vessels and thoracic duct and thus reach the tissues in question. Invasion of the perilymphatic space of the cochlea (*scala vestibuli*) can furthermore take place from the subarachnoid spaces through the ductus perilymphaticus of the aquæductus cochleæ. But how is it with the endolymphatic spaces which possess no blood-vessels? Light is thrown upon the subject by the injection experiments of Schwalbe, Key and Retzius, which demonstrate a connection on the one hand between the subdural space and the lymphatics of the nasal mucosum and the deeper ones of the neck;⁴ on the other hand, between the subdural space and the subdural spaces of the nerve-roots and there with the lymph channels of the peripheral nerves. This does not yet tell us, however, how the micro-organisms get into endolymphatic space. The ductus endolymphaticus is continuous, it is true, with the cavities of both vestibular sacculi, but ends as a blind sac between two dura lamellæ. We can imagine that the microbes might gain entrance to the aquæductus vestibuli from the dura by way of the fibrous-periosteal connective tissue intimately connected with it, which lines the bony aquæduct, and contains numberless fissures supposed by Schwalbe to be lymphatic vessels. Support for this assumption is found in one of the preparations of Moos, which shows at this point the changes before described.

The sudden, often total and permanent, loss of hearing and the disturbed equilibrium sometimes observed during the course of diphtheria, especially in children, and that without tympanic phenomena, finds in these researches a ready explanation. It is unnecessary to recapitulate the pathological changes corresponding to the respective symptoms.

REFERENCES.

1. Arch. of Otol. 2. Arch. of Otol. 3. Neg. Valsalv. 4. Erskine, Diseases of the Ear. 5. Dent. Med. Woch. 6. Arch. f. Ohrenheilk. 7. Arch. of Otol. 8. Trans. Am. Otol. Soc. 9. Arch. of Otol. 10. Allg. Wien. Med. Zeit. 11. Revue de Laryng. 12. Arch. f. Ohrenheilk. 13. Quoted by Bull. N. Y. Med. Jour. 14. Typen der Schwerhörigkeit, Berlin, 1886. 15. Med. News. 16. Allg. Wien. Med. Zeit. 17. London Med. Gaz., 1842. 18. Revue mens. de Laryng. 19. N. Y. Med. Presse. 20. Jour. Am. Med. Assoc. 21. Med. Register. 22. Med. Press and Circular. 23. Revue mens. de Laryng. 24. Die Tragus Presse. 25. Revue de Laryng. 26. N. Y. Med. Jour. 27. Arch. of Otol. 28. Med. and Surg. Rep. 29. Erskine, Diseases of the Ear. 30. Brit. Med. Jour. 31. Arch. f. Ohrenheilk. 32. Erb. Electrotherapie. 33. Bull. d. l. Acad. de Méd., 1836. 34. Gaz. Méd. de Paris, 1860. 35. Polyclinic. 36. Arch. f. Ohrenheilk. 37. Arch. f. Ohrenheilk. 38. Lancet. 39. N. Y. Med. Jour. 40. Lyon Méd. 41. Cent. f. Nervenhe., etc. 42. Deut. Arch. f. klin. Med. 43. Wien. Med. Presse. 44. Allg. Wien. Med. Zeit. 45. Practitioner. 46. Revue de Laryng., etc. 47. Glasgow Med. Jour. 48. Med. Press and Circular. 49. Jour. de Méd. et de Chir. 50. Dr. J. W. Kales, Franklinville, N. Y. 51. Revue mens. de Laryng. 52. Revue de Laryng., etc. 53. Bull. d. mal. d. gola, d. orecchio, etc. 54. Tageblatt d. 60 Vers. Deut. Naturf. u. Aerz. 55. Arch. of Otol. 56. Cohnheim, Allg. Pathologie, 1882. 57. Cent. f. d. med. Wissen., 1864. 58. Trans. Am. Otol. Assoc., 1873. 59. Cent. f. d. med. Wissen., 1864. 60. Cent. f. d. med. Wissen., 1864. 61. Berlin klin. Woch., 1865. 62. Berlin klin. Woch., 1865. 63. Allg. Zeit. f. Psych., 1867. 64. Zeit. f. rat. Med., 1865. 65. Arch. f. Ohrenheilk. 66. Arch. f. Ohrenheilk. 67. Editorial. 68. Med. Record, 1886. 69. Arch. f. Ohrenh. 70. La Clinique. 71. Cent. f. d. ges. Ther. 72. Cinn. Lancet-Clinic. 73. Le Progrès Méd. 74. Monats. f. Ohrenh. 75. Lehrbuch der Ohrenh. 76. Schulte, die Alcohol. 77. l'Union Méd. du Canada. 78. Hartmann. 79. Liverpool Med. Chir. Jour. 80. Trans. N.Y. Co. Med. Soc. 81. Monats. f. Ohrenh. 82. Trans. Am. Otol. Assoc. 83. Vratsch. 84. La Semaine Méd. 85. Verh. d. Würzb. Phys. Med. Gesell. 86. Arch. of Otol. 87. N. Y. Med. Jour. 88. Allg. Wien. Med. Zeit. 89. Brit. Med. Jour. 90. Ann. des mal. de l'Oreille. 91. Pilzinvasion des Labyrinthes im Gefolge einer einfachen Diphtheritis. 92. Photographic Illustrations of the Anatomy of the Human Ear, Phila., Blakiston, 1887. 93. Arch. f. mikros. Anat. 94. Sonderabdruck aus Festschrift f. A. von Kölliker, Leipzig, 1887. 95. Revue mens. de Laryng. 96. Wien. Med. Woch. 97. Eulenberg's Realencyklopädie. 98. op. cit. 99. Arch. f. Ohrenheilk. 100. Verbal communication. 101. N. Y. Med. Jour. 102. N. Y. Med. Jour. 103. Southern Med. Rec. 104. Lancet. 105. Lyon Méd., 1886. 106. Weekly Med. Review. 107. Revue Méd. d. l. Suisse Romande. 108. Provincial Med. Jour. 109. Arch. f. Ohrenh. 110. Jour. Am. Med. Assoc. 111. Deut. Med. Woch. 112. Deut. Med. Woch. 113. Revue mens. de Laryng. 114. Fortschr. der Med. 115. Fortschr. der Med. 116. Naturf. u. Aerg., 1885. 117. Berlin klin. Woch. 118. Arch. f. Ohrenheilk. 119. Arch. f. Ohrenheilk. 120. Note sur l'emploi de l'iodol dans le traitement de l'otite pur. chron. Bruxelles, Ramlot. 121. Therap. Monats. 122. Am. Jour. Med. Sci. 123. Ann. des mal. de l'Oreille. 124. Am. Pract. and News. 125. Med. News. 126. Am. Med. Digest. 127. Am. Pract. and News. 128. Weekly Med. Review. 129. Cinn. Lancet-Clinic. 130. La Semaine Méd. 131. Pacific M. and S. Jour. 132. Archiv. f. Ohrenh. 133. Jour. de Méd. de Paris. 134. Med. Rec. 135. Am. Jour. Med. Sci. 136. Brit. Med. Jour., 1886. 137. Brit. Med. Jour. 138. Arch. of Otol., 1886. 139. Monats. f. Ohrenh., 1885. 140. Arch. of Otol., 1884. 141. Brit. Med. Jour. 142. Edinburgh Med. Jour. 143. Brit. Med. Jour. 144. Zeit. f. Biol.

[Undated references apply to journals published in 1887, and original articles can be found by consulting the indexes of the respective publications.]

DISEASES OF THE NOSE AND ACCESSORY CAVITIES.

By CHARLES E. SAJOUS, M.D.,

PHILADELPHIA.

EPISTAXIS.

Etiology.—Structural hepatic disease, whether latent or active, as an etiological factor in the production of rebellious epistaxis, was emphasized by Verneuil,¹ who based his conclusions upon clinical observations and upon the results obtained with measures directed to the liver. In the course of the discussion, which took place at the Paris Academy of Medicine, Dujardin-Beaumetz suggested, as an explanation, the impaired hæmatopoietic action of the liver and the consequent alteration of the blood,—a view subsequently expressed by Harkin,² of Belfast, who further defined this alteration to be anæmia, this in turn inducing an hæmorrhagic diathesis. Colin,³ of Alfort, considers the hepatic lesion but secondary to a heart affection, and concomitant with the tendency to epistaxis as a symptom of the latter, the cardiac influence in causing the hæmorrhage being an increased tension of the capillaries of the pituitary, and consequent rupture of some of them. As demonstrated by Verneuil, this view is not verified by his cases, none of them having presented the least evidence of heart disease. Bandler,⁴ of Prague, in a series of careful observations, conducted in 37 cases in which intermittent epistaxis had existed from two days to ten years, found a small hyperæmic spot in 26, and a cup-shaped excoriation in 11, all (with the exception of 2) situated in the anterior portion of the septum, and bleeding profusely upon the slightest touch of the probe. Beverly Robinson,⁵ of New York, states that an erosion, variable in extent and depth, is usually found in the membrane covering the cartilaginous septum, and that an eroded surface, the size of a pin's head, when situated over an arterial twig, is sometimes sufficient to cause considerable hæmorrhage.

The observations of Verneuil and Harkin, associated with those of Bandler and Robinson, would suggest that epistaxis in disorders of the liver, especially during the first stage of cirrhosis, might be ascribed to impeded hepatic circulation, this inducing vascular tension in the afferent vessels, labored cardiac action and cerebral congestion (the symptoms of which are frequently met with early in the history of cases) and consequent rupture of capillaries in portions of the nasal fossæ weakened by local disease.

Martin⁶ considers astigmatism as a frequent cause of epistaxis, the strain acting as the exciting factor. Merignac⁷ attests to the rarity of nosebleed in old age, senile atrophy of the membrane and impermeability of the vessels being suggested as causes.

Treatment.—In the cases reported by Verneuil,¹ in which epistaxis found its primary cause in a disorder of the liver, blisters applied over that organ were at once successful after the usual measures had failed. Harkin² also recommends this treatment in the highest terms, associating with it chlorate of potassium and a soluble salt of iron (doses not given), which are especially valuable in diathetic cases. Echeverria⁸ reports in this connection a case of nosebleed due to hæmophilia, in which even anterior and posterior plugging were of no avail, and which yielded at once to the application of a blister to the right hypochondrium, though no evidence of hepatic disease could be found. De Forrest Willard,⁹ of Philadelphia, uses oil of erigeron (canad.) 5–15 drops on sugar, repeated as needed, with signal success. Small quantities of cocaine applied with the insufflator and followed immediately with powdered tannin, is recommended by Fletcher Ingals,⁵ of Chicago. Antipyrine is recommended by Beverly Robinson,⁵ administered in capsules of 5, 10, or 15 grains, this being an accessory to local treatment, in diminishing local tension. Plugging of the posterior nares for epistaxis can produce, according to Gellé,¹⁰ purulent bilateral otitis. Decomposed blood is forced into the Eustachian tubes during deglutition, giving rise to violent inflammation. In a case seen by him, perforation of both membrana tympani had been caused. Beverly Robinson⁵ deprecates the use of the galvano-cautery in the treatment of epistaxis, having known it to render a slight affection lasting and very troublesome, by producing erosions especially hard to heal in cases of atrophic rhinitis.

ACUTE RHINITIS.

Nothing of much importance has been presented upon this subject during the year, the few contributions published relating principally to treatment.

Ruault,¹¹ of Paris, recommends benzoate of sodium as especially valuable in the form of coryza followed by cough, and advocates large doses,—one to two drachms three or four times daily. The gastric disturbance occasionally induced by this drug, however, rather militates against its use. Fritsche,¹² of Berlin, recommends salicylic acid in doses of three to four and a half grains from five to seven times daily, according to the intensity of the case. During the interval the patient should use Hagar's olfactorium aceto-carbolicum. (Acid acet. glac. et acid carb., āā gr. xxx; mist. oleoso-balsam (Germ. Ph.), ʒij; and tr. moschi, gr. xv.) 50 drops are poured upon cotton wool and placed in a wide-mouthed bottle. At first the patient inhales the fumes about ten minutes every half hour; later the inhalations are taken at longer intervals.

The dangers of the belladonna treatment are exemplified by a case reported by Chas. Baum,¹³ of Philadelphia, in which the administration of sulphate of atropia in the form of granules of gr. $\frac{1}{100}$ each, given two hours apart, produced dangerous toxic symptoms. The first granules causing dryness of the mouth and dyspnœa, the attendant administered the second much sooner than ordered by the physician. The occasional presence of unusual susceptibility to the effect of the drug render it positively dangerous unless prescribed in doses not exceeding gr. $\frac{1}{200}$ at first, with instructions to the patient as to the importance of implicitly following the directions.

CHRONIC RHINITIS.

Etiology and Symptomatology.—Bresgen¹⁴ expressed the opinion that the one-sided occlusion of the nose which takes place when the patient lies on that same side, is not caused by gravitation of the blood to the deep structures, as generally believed, the anatomical disposition of the turbinated bodies being such as to facilitate, on the contrary, the egress of the blood from them. He believes that this symptom is due to nervous influence, which he is not yet able, however, to explain. The editor would beg to

suggest that the engorgement of the membrane probably occurs as a result of the physical law through which "fluids in communicating vessels are at rest only when their surfaces are in the same horizontal plane." The blood, massed, as it were, on the recumbent side of the head, raises the relaxed membrane in its effort to regain what would be the blood level were the distribution not equalized to a degree by the vascularization, this blood level being considerably above the plane of the engorged tissues.

Seiler,¹⁵ of Philadelphia, reported a number of cases of acne occurring as a result of chronic rhinitis. The forms observed were acne rosacea and acne vulgaris, which, under appropriate treatment of the nasal cavities, promptly disappeared. The relation between nasal and cutaneous affections was also alluded to by Arnozan,¹⁶ of Bordeaux, who insisted upon the advisability of always examining the interior of the nose in cutaneous affections of that organ.

Treatment. — Cozzolino¹⁷ is reported by Prof. Massei, our Corresponding Editor in Milan, Italy, as obtaining satisfactory results from the use of alcohol, as a substitute for galvano-cautery or chromic acid. It is used either pure or with the addition of tannic, boric, salicylic acid or other drugs in general use, and applied locally with a pledget of cotton. John N. Mackenzie,⁵ of Baltimore, recommends a 4 per cent. solution of hydrogen dioxide for catarrhal affections attended by profuse muco-purulent discharge, administered in doses of ʒj to ʒss three, four or even six times a day. Locally he uses the 6 per cent. solution. In certain persons even weaker solutions produce local irritation, and the drug cannot be employed. The internal administration of the remedy being attended by improvement of gastric functions, its use in the many cases in which gastric disturbances aggravate the nasal troubles would probably assist materially in bringing about a cure. Resorcin continues to be a favorite remedy of the editor's. He has found its effects most beneficial when used not more than once daily and in a solution not stronger than 5 grains to the ounce of distilled water.

HYPERTROPHIC RHINITIS.

Pathological Anatomy.—Chatellier¹⁸ presented at a meeting of the Société Anatomique, a microscopical section of hyper-

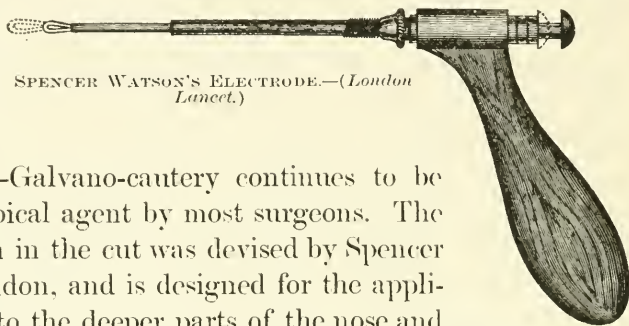
trophied mucous membrane, obtained from a case upon which he had recently operated with the snare. The section showed comparatively straight canals traversing perpendicularly the basement membrane, which expanded and opened upon the surface of the latter, immediately beneath the epithelial layer. Below, their orifice also expanded, to become lost among the lymphatic capillaries, abundant in hypertrophied membrane. The preparation showing clearly the presence of migratory cells in the canals, the arrangement of the latter and their general conformation, explains how migratory cells can gravitate to the epithelial layer, and how the profuse secretion, frequently out of all proportion with the glandular elements, can transude through the mucous layer.

Symptomatology.—Guye,¹⁴ of Amsterdam, referred to a mental disturbance occurring as a result of nasal affections consisting in inability to fix the attention upon a special object, which he proposed to term *aproxexia* (inability to fix),—a condition almost entirely overlooked so far. Great inaptitude for intellectual work is the result, and when such is attempted, a sensation of vertigo is experienced. He reported three cases of nasal stenosis, either anterior or posterior, in which this condition existed to a marked degree, and in which medicinal treatment produced no effect. Reduction of the hypertrophied tissue by cautery or other means brought about complete relief. Guye ascribes this condition to obstruction to the elimination of products formed in the brain which cannot be assimilated, Axel Key and Retzius having shown that communication between the lymphatic spaces under the dura mater and the mucous membrane of the nasal fossæ exists.

Our Corresponding Editor, Dr. de Havilland Hall, of London, sends an abstract of a paper by Dr. Scanes Spicer, in which he drew attention to the black distended vein at the root of the nose as a striking physiognomical peculiarity of a large number of children, especially the feebler offspring of the poorer classes in large towns. This vein—the nasal arch—forms a transverse communication between the angular veins on either side. Associated with this condition is a neglected or intractable chronic catarrh of the nose and pharynx, often with swollen middle turbinated bodies and rhinorrhœa; chronic congestion or hypertrophy of post-nasal mucosa, or post-nasal vegetations are also present. As a sign of the morbid condition of the post-nasal space, this distended vein is

of great importance. If neglected, venous congestion of the nasal mucosa leads to hypertrophic catarrh, nasal obstruction and its train of attendant evils; and also by causing impaired nutrition of the framework of the nose, the bony and cartilaginous structures are imperfectly evolved, so that in adult life the nose will be sunken and ill-shaped. Moreover, children suffering from this condition look heavy and drowsy, and complain of headache and noseache.

Dr. P. W. Logan,¹⁹ of Knoxville, Tenn., describes a form of rhinitis which might be considered as intermediate between the hypertrophic and atrophic varieties. The membrane does not present the dry appearance of atrophy, although there is insufficient secretion to lubricate the surface sufficiently and the sensation of dryness is experienced. This sensation exists also in some cases in which the hypertrophic condition predominates, with copious secretion.



SPENCER WATSON'S ELECTRODE.—(*London Lancet*.)

Treatment.—Galvano-cautery continues to be preferred as a topical agent by most surgeons. The instrument shown in the cut was devised by Spencer Watson,²⁰ of London, and is designed for the application of cautery to the deeper parts of the nose and throat, which cannot be reached easily by the loop of the snare. Its manipulation is described by the inventor as follows: "Contact with the battery is made by pressure with the thumb on the button. At the same time that contact is made the point is protruded, and takes the position shown. The shaft is a metal sheath in which the platinum wire is made to advance or recede. As soon as the cautery has acted sufficiently, pressure is removed from the button, when the point again recedes to its position, and at the same time, contact being cut off, the wire speedily becomes cool, and the instrument can then be removed without danger of cauterizing the healthy parts."

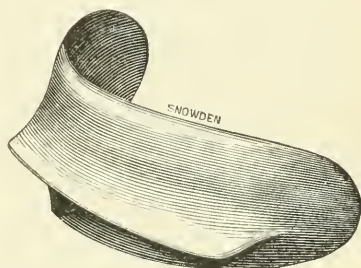
Mermod,²¹ of Yverdon, Switzerland, reports excellent results in two cases of chronic rhinitis treated by electrolysis. The method of application is extremely simple, a common continuous current battery serving every purpose. The applicator of the

positive rheophore should present as broad a surface as possible, while that of the negative should be replaced by a needle, such as that of a Pravaz syringe. For the anterior nasal cavities a rubber speculum had best be introduced to insure insulation in case of accidental contact during introduction. The positive pole is applied on the cheek as near the needle in the cavity as possible, to avoid diffuse distribution of the current. For operations in the naso-pharynx it is applied over the ligamentum nuchæ. The mucous membrane should be completely traversed by the needle and the circuit closed during four or five seconds, this being repeated a number of times while the needle is *in situ*. A slight crepitation is heard, and a little white foam is observed to emerge around the needle. A weak current will usually suffice. When this is too strong, giddiness is experienced, accompanied by pain in the superior maxillary region. The only drawback to this method is the pain, which is sometimes very great. A 25 per cent. solution of cocaine, however, applied two or three times before each application, materially diminishes it. Four or five sittings are usually sufficient for a cure.

A word of caution against too great enlargement of the nasal cavities by operative procedures is published by Routier,²² who reports a case in which ozæna promptly followed an operation for sarcoma, the large size attained by the cavity in accommodating the tumor being doubtless the cause of the secondary condition.

Cauterization of the nasal mucous membrane is reported by Zien²³ as having caused ocular trouble in two cases. In the one, cauterization of the right turbinated body caused right-sided amblyopia, while in the second the eye on the side of the cavity treated presented marked venous engorgement with pupillary hyperæmia. Berger⁶ also reports a case of marked amblyopia occurring as the result of the application of galvano-cautery to the nasal membrane.

For the relief of mouth breathing and its pernicious consequences, Dr. R. M. Gordon²⁴ has presented the instrument shown in the above cut, which seems admirably adapted to the purpose.



GORDON'S MOUTH OBTURATOR.—(*Jour. Am. Med. Assoc.*)

It is made of celluloid, and is inserted between the lips and teeth, therefore requiring no bandage or support. It is too large to be accidentally swallowed, and the close apposition of the lips to its anterior surface causes complete obstruction.

ATROPHIC RHINITIS.

Our Paris Corresponding Editor, Dr. Gouguenheim, sends a review of a very interesting paper by Noquet,¹⁰ of Lille, upon the pathogenesis of atrophic rhinitis. Discussing the hypothesis of Zaufal and Calmettes, he rejected that of congenital atrophy held by the former and that of arrested development by the latter. As to Löwenberg's opinion that the affection is due to the presence of a microbe, the undeniable presence of these did not prove, he thought, their position as etiological factors. In none of his cases was there syphilis, or even clearly defined scrofula,—these facts having been established, not only by careful examination of the history of the patient, but in several cases by examination of their relatives. In but one of the patients did he find the "saddle nose," upon which Zaufal and others lay stress, and therefore does not consider this particular shape as of importance in the history of the disease. That atrophic rhinitis can occur in the well constituted as well as in the weakly is beyond doubt. He further observed that fetor of the breath was most marked in young subjects, and that after the age of 20 it became less intense.

Routier²² reports a case in which ozæna promptly followed the eradication of a nasal sarcoma, which would be due to the enlargement of the cavity to accommodate the growth, if the theory of Gottstein, Zaufal, Hartmann and others is correct.

Hajek²⁵ presented at the Imperial Society of Physicians, Vienna, an interesting bacteriological study of atrophic rhinitis, which tended to demonstrate that although the clinical progress of the disease presents nothing in common with that of a bacillary affection, the absence of bacteria in the mucous membrane renders unlikely any etiological connection between the bacteria and the disease. It is quite probable that the great number of bacteria found in the secretions play an important part in the production of the fetid odor only, the affection proper being due to a combination of several causes.

Habermann,¹⁰ of Prague, found disease of all the glands, acinous as well as those of Bowman. The affection is characterized at the start by an accumulation of drops of fat in the epithelium, followed later on by complete degeneration of the latter. Inflammatory infiltration of the mucous membrane then occurs, complicated with granular degeneration of the infiltrated cells, and in certain parts are found the drops of fat already described by Krause, of Berlin. Shrinking of the membrane, and absorption of bone, with the formation of lacunæ and atrophy of the venous sinuses then occurs. Habermann believes that the morbid agent first acts upon the surface, that is to say by the external orifices of the glandular elements.

Treatment.—Unlike the majority of observers, Noquet,¹⁰ of Lille, believes that well directed and carefully carried out treatment for a prolonged period can bring about a complete cure; and in several young subjects he was able to induce marked regeneration of the atrophied parts. Cleansing by means of the douche is the first step, Weber's being used twice a day with a tablespoonful of chlorate of potassium to the quart of tepid water. After each ablution, spraying with the following solution is recommended; R_x chloral hydrate, gr. vij; boracic acid, ʒiiss; pure glycerine, ʒiiss; cherry laurel water, ʒv; distilled water, ʒviiss.

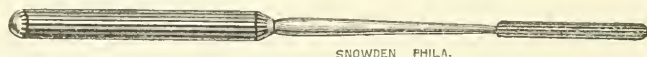
The spray is first directed horizontally so as to reach the pharyngeal, then in all directions to thoroughly lubricate the nasal membrane. About noon the patient uses a spray composed of a teaspoonful of antiseptic vinegar in about seven ounces of vinegar. After a week the chlorate of potassium treatment is replaced by a solution of carbolic acid, ʒss. to the quart. In addition to this a 20 per cent. solution of chloride of zinc, rendered clear by adding a few drops of hydrochloric acid, is applied with a cotton pledget two or three times a week by the physician, with anterior and posterior cotton-holder.

Bryson Delavan,²⁶ of New York, recommends the use of the galvanic current, advocated by Shurly, of Detroit. The positive pole of a constant current battery being applied to the nape of the neck by means of a flat sponge electrode, the negative pole is applied directly to the nasal membrane by means of a piece of common copper wire, around which has been loosely wrapped a pledget of absorbent cotton, saturated with lukewarm water. The

strength of the current should range between four and seven milliamperes, and the sitting last until the irritation caused by the current has been sufficient to provoke a slight watery discharge,—usually from five to twelve minutes.

R. W. Seiss,⁵ of Philadelphia, recommends thymol in the highest terms. In early cases in which abrasions do not exist, he uses gr.ss of the drug to an ounce of distilled water containing ʒss each of glycerine and alcohol; this is applied with the atomizer two or three times a week. In advanced cases, he uses gr.iss, gr.v and gr.x of thymol to the ounce,—the two latter strengths being applied with the cotton pledget, after spraying the parts clean with the gr.iss solution. Each application should be followed with fluid cosmoline used in an atomizer. The deeper abrasions are occasionally touched with a solution of 100 grains of nitrate of silver to the ounce of distilled water, while strict attention is paid to the general health.

Mr. Richard Williams,²⁷ of Liverpool, has devised a neat cotton-holder which, by means of the parallel ridges that can be seen near its extremity, enables the soiled cotton to be easily removed when the operation is completed. It can be used to



WILLIAMS' COTTON-HOLDER.—(*Liverpool Medico-Chirurgical Journal*.)

loosen the crusts and facilitate their removal as well in the pharyngeal vault as in the anterior cavities, the same instrument being made bent at an angle. His treatment consists in part of the application of powders. He also devised an insufflator, which differs from others of its kind in the fact that the receptacle is placed at the end of the instrument, this arrangement reducing the resistance to the discharge of the powder to a minimum.

Dubousquet Laborderie,²⁸ of Paris, reports a number of cases in which complete recovery was obtained by engrafting the skin of the frog over the ulcerated surfaces, using the skin of the belly or the interdigital membrane of the animal. From 10 to 20 grafts were employed, more than half of these taking effect.

As reported at the last meeting of the American Laryngological

Association, the editor²⁶ has observed considerable benefit follow local applications with the probe once a week of a saturated solution of chromic acid, cleanliness of the membrane being a strict accompaniment of the treatment.

SYPHILITIC RHINITIS.

Moure,¹⁰ of Bordeaux, reported an extremely interesting case of indurated chancre of the right nasal fossa, which served to show that although of the greatest rarity, primary syphilis of the nose should be taken into consideration in differential diagnosis of intranasal growths. The patient, a man 53 years of age, denied having had the least evidence of syphilis at the penis, examination corroborating his assertion. Intense redness of the nose on the affected side with marked elevation of the wing were first observed, and within the nose a fungous mass, reddish in places and grayish in others, filled the cavity and extended about two centimetres posteriorly. The point of insertion was the septum. The least touch of the probe caused bleeding. The other cavity, as well as the other portions of the upper respiratory and alimentary tract were perfectly normal. The submaxillary ganglia of the right were tumefied, one being especially large, but painless. The case was placed under specific treatment, and soon recovered entirely. The only explanation that could be made as to the manner in which the nose had become infected was furnished by the avowed habit of the man of inserting his finger into his nose to cleanse it of accumulations of dust, etc., which his occupation occasioned.

The diagnosis of primary nasal chancre is at best a difficult matter, but its tendency to bleeding, its characteristic appearance, the small dimension of the tumefaction to present ulceration, and the early cervical adenitis, would render its differentiation from sarcoma—the most frequent malignant growth of the nasal cavities—possible.

Treatment.—Nothing of much importance was presented during the year. David Newman,²⁹ of Glasgow, laid stress upon the necessity of forbidding the use of tobacco in all its forms during the administration of specific remedies. In cases where mucous patches in the upper air-passages had persisted for long periods after constitutional treatment had been employed, these disappeared after smoking was discontinued.

NASAL TUBERCULOSIS.

Etiology.—Cartaz,³⁰ of Paris, added a valuable contribution to the literature of this subject, in which he reviewed the cases so far reported, including one communicated verbally to him by Ruault of Paris, a case in his own practice, and the six published this year by Schäffer and Nasse. The total number collected, leaving out all cases of lupus, amounts to 18, to which may be added a case recently reported by Moure and Natier,³⁰ of Bordeaux, and another admirably described by Dr. J. E. Boylan³¹ before the Cincinnati Academy of Medicine. Cartaz believes that the repeated irritation of the mucous membrane, frequent coryza, or chronic catarrh, may predispose the nasal cavities to tuberculosis by inoculation, an abrasion of the epithelium forming a suitable nest for the entrance of bacilli. The ulceration frequently covers but one spot, usually located on the septum, about one half inch from the nostrils, and varying in size from that of a dime to a twenty-five cent piece. It is generally oblong with slightly raised edges, everted at times, at others sharply cut. The surface is grayish pink, with reddish areola, masses of muco-pus concealing it from view. At the periphery of the ulcer small yellowish spots (tubercles in process of evolution) may be seen, which soon become minute specks of ulceration, and doubtless form the first phases of the local trouble. At times the ulceration is located at the margin of the nostril, extending thence to the lip below.

The differential diagnosis presents some difficulty, owing to the fact that the yellow tuberculous spots are not always to be seen. In the cases collected by Cartaz, the concomitant pulmonary or laryngeal trouble, however, served to establish the diagnosis at once. But in the cases recently reported by Schäffer, pulmonary or laryngeal lesions were not present, and in two hereditary taint even could not be traced. It is to be noticed, however, that these cases varied considerably in physical properties from the description given above, all being described as growths varying in size from a pea to a nut, situated also on the septum. This caused Bresgen¹⁴ to doubt their identity with true tuberculosis of the nose, and not unreasonably, perhaps, his opinion being based upon a case seen by him which presented physical properties resembling greatly those of Schäffer's cases, and which was shown to be one of lupus,

through the presence of the latter in other parts of the septum. The probability is, however, that the tumors characterize a special form of tuberculosis of the nose, as believed by Koenig. Lennox Browne,²⁰ of London, reported a case of a woman aged 20, in whom the nose took part in the tuberculosis of pharynx and larynx. The presence of bacilli verified the diagnosis.

Treatment.—Were the local trouble not usually the manifestation of a general dyscrasia, local measures, as galvano-cautery, would quickly overcome it. Cartaz³⁰ recommends the latter especially for small ulcerations, after inducing complete local anæsthesia with a 20 per cent. solution of cocaine. For extensive ulcerations he advises lactic acid, (previously recommended by Krause, after scraping,) in solution varying from 20 to 50 per cent. Iodoform insufflated on the ulcer and then covered with a pledget of cotton soaked in glycerine, is also extolled; all this, of course, after proper cleansing of the surface, and in connection with appropriate systemic medication. In Lennox Browne's case the lactic acid treatment, carried out as recommended by Krause, (cocaine anæsthesia, scraping and 20, 40 and 60 per cent. solution) for a period of three weeks entirely relieved in due time the dysphagia occasioned by the pharyngeal abrasions and the nasal trouble accordingly.

LUPUS.

Cozzolino¹⁷ reports five cases of lupus of the nasal mucosa. With Volkmann, he considers it as a modified form of tuberculosis of the skin, that predominating in the nose being lupus vulgaris. He does not agree with many writers who ascribe many cases of lupus to hereditary syphilis, considering the latter dyscrasia only as a possible factor in the scrofulous taint. He admits, however, a certain degree of resemblance with syphilis, pathologically. As to treatment, he advocates destructive means, galvano-cautery, thermo-cautery and disinfection of the cavities. Bresgen,¹⁴ of Frankfort, reports the case of a lady aged 38, who had a bleeding tumor as large as a nut and covered with granulations on the left side of the septum. It was destroyed by galvano-cautery and chromic acid. Lupus patches on the skin proved it to be lupus. Moure and Natier¹⁶ presented a case in which the lupus involved the nose and the naso-pharynx. The anti-syphilitic treatment first tried bringing no result, applications of lactic acid with

internal and tonic treatment brought about considerable relief. Rafin,³² of Lyons, reports a case of eight years' standing in a young man, in whom the half of the left nostril had been destroyed, the inside of the nasal cavity being filled with scabs. Flaxseed meal poultices were first used to detach the latter, after which the denuded surface was touched with an 80 per cent. solution of lactic acid, as advised by Mosetig. The ulceration entirely ceased, and the case was on a fair way to recovery. Silitch,³³ of St. Petersburg, reports two cases in which calculi were found in the nasal cavities of two patients suffering from lupus of the nose, and removed.

NASAL FIBROMATA.

Alluding to the rarity with which fibromata of the nasopharynx occur in the female, Phuyette,²² of Marseilles, suggests as a cause the revulsive effect of menstruation, which detracts the neo-formative tendency from the basilar process to the uterus. In the nine cases of fibroma in the female which he was able to find in the literature of the subject (several of which are of doubtful authenticity), in only one was the menstruation at all alluded to. He can only therefore present his idea as a hypothesis, which seems to be favored, however, by the age at which fibroma most frequently occurs in woman, either before the period of maturity or after the menopause, and the arrest of menstruation in the only case in which the latter is spoken of.

Cases of well authenticated fibromata are reported by Massei,¹⁷ of Naples, Rey,³⁴ and Cozzolino³⁵. In the first case galvano-cautery being used, a high fever occurred on the third day, followed by otitis media with perforation of the membrana tympani. Lincoln,²⁶ of New York, reports an interesting case of fibroma of the vault, in which electrolysis produced complete and permanent absorption. The growth was about the size and shape of a horse-chestnut, and nearly filled the left half of the post-nasal space. DeRossi,¹ of Rome, highly recommended electrolysis, which in his hands had always given good results.

RHINOLITHS.

Among the many cases of rhinoliths reported—Hunt,²⁹ of Liverpool; Témoins,³⁶ of Paris; J. M. Bigelow,³⁷ of Albany; E. Creswell Baker,²⁰ of Brighton; E. Nolte,³⁸ Moure,¹⁶ Shotz,³⁹

Silitch,³³ Stein,³⁹ of Berlin; Morelli,⁴⁰ of Pesth; Hendley,³⁵ of Jey-pore; Ferré,¹⁶ of Bordeaux—that of Mr. Augustus F. Clay,⁴¹ of Birmingham, England, presents special interest. The patient, a man aged 37, had had persistent headache during the past two years, and there was a deviation of the nose and nostril, with marked bulging of the upper cheek, accompanied by fetid breath, stenosis and local tenderness. Upon examination, a brown sub-



RHINOLITH.—(*Brit. Med. Journal.*)

stance was seen in the inferior meatus, which upon being extracted by means of a strong polypus forceps, the patient being under chloroform, proved to be a rhinolith shaped as shown in the cut, one inch and a half long. The weight when dried was 110 grains. On cutting into its base, the half of a cherry stone was found, which had been there at least 45 years, at which time the first symptoms of the trouble were noticed.

NASAL POLYPI.

Our Corresponding Editor, Dr. de Havilland Hall, reports two cases of polypi in subjects respectively 11 and 16, operated upon by Dr. Bond. of London. The extreme rarity of polypi before the age of 16 is shown by the fact that Morell Mackenzie has only met with one in so young a subject.

Treatment.—Lange,⁴² of Copenhagen, describes a novel procedure for the removal of nasal polypi situated in the posterior portion of the nasal cavities and projecting into the naso-pharynx. The left finger, introduced behind the soft palate, having made out the exact conformation of the growth and the situation of the pedicle, his instrument, a sort of button-hook with a long handle, is passed into the nose. Guided by the finger touching the tumor, the hook is adjusted over the pedicle. Gentle traction is now practiced and gradually increased if necessary, the mass is

torn from its seat of implantation and pushed out anteriorly by the finger, or left *in situ* to serve as a tampon, should the bleeding be excessive. This, however, is not usually necessary.

Berrucco,⁸ of Madrid, affirms, contrary to general teaching, that nasal polypi are generally sessile; that operative instruments such as the snare can at best bring about but incomplete results. Daily injections of five to ten drops of a concentrated solution of tannic acid by means of a hypodermic syringe are recommended by Bell,²⁰ of Montreal. The polypus soon sloughs and comes away without bleeding. The proximity of the applications to each other is doubtless an important element in the tannin treatment, which otherwise does not always prove effective.

As regards sequelæ, Luc,⁴³ from close observation in a series of twenty cases, believes that recurrence is much more likely to take place in young than in old subjects.

The transformation of the mucous polypi into malignancy (carcinoma or sarcoma) is further demonstrated by Bayer,¹⁰ of Brussels, who reports a case in which a myxoma had degenerated into a villiform carcinoma, and another in which a polypus was found to contain epithelial casts.

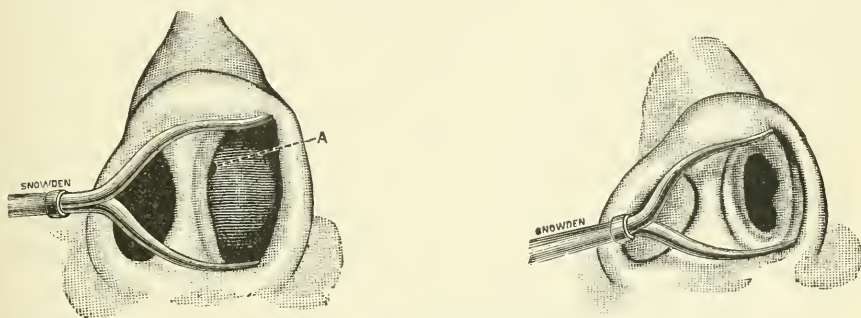
SARCOMA OF THE NOSE.

Calmettes and Chatellier⁴⁴ report a case of sarcoma of the nose, the true nature of which was verified by microscopical examination, and which, while presenting all the usual symptoms of this variety of neoplasm, including epistaxis, terminated as a benign tumor without recurrence. Another case of sarcoma was reported by Routier,²² of Paris, which nine months after the operation had shown no sign of recurrence. Cases of recovery without recurrence are also reported by Boursier,¹⁶ of Bordeaux, and Moure,¹⁶ which clearly demonstrate that sarcoma of the nose is not as malignant as is generally believed. J. D. Thomas,⁴⁵ of Sydney, reports a case in a girl of 14, in which the tumor was wrenched out by means of Woakes' forceps. It weighed 90 grains, and was attached to the naso-pharynx by means of a short pedicle.

CONGENITAL OCCLUSIONS OF THE NOSE.

Dr. W. C. Jarvis,²⁶ reports two very interesting cases of congenital occlusion of the anterior nares. In the one, a boy 18

years old, the nostrils were patent to a distance of about four millimetres, when a white, smooth, glistening surface, cup-shaped partition met the eye on each side, that of the left nostril being perforated by a small opening (see A in cut), through which a small probe could be passed with difficulty. The partition, found to be of dense fibrous tissue, was successfully perforated by drills operated by means of a dynamo. In the second case, a girl of 16, two pale pink protuberances completely blocked up the inferior meatus, which was found to be bony through defective conformation of the osseous framework of the face. Rongeur forceps were used to penetrate them, with only temporary restoration of the normal breathing. In both cases the aspect of the posterior nares was normal as far as the seat of obstruction. No special diathetic taint could be discerned in either case.



JARVIS' CASE OF CONGENITAL OCCLUSION OF THE ANTERIOR NARES.—(*New York Med. Journal.*)

Numerous interesting cases have been added to the literature of occlusion of the posterior nares. Dr. Alvin A. Hubbell,⁴⁶ of Buffalo, reported a case of congenital occlusion of the posterior nares in a young man 18 years of age. The sense of smell was characterized as "very weak," if he could "smell at all;" the sense of taste, however, was good; that of hearing was perfect, the only source of real annoyance being dryness of the mouth and lips, owing to the necessity of breathing through them. A drill as large as the nose would admit was used to make an opening on each side, sounds and tents being used to keep the perforations open. Seven weeks later the patient returned with the openings so contracted as to seriously interfere with breathing. Operation was repeated, and tin tubes were introduced, through which the patient could breathe freely. These were left *in situ* for about

two months, when they were withdrawn. Seen several months later, the patient breathed perfectly. Dr. Hubbell, in searching the literature of the subject, has found sixteen cases.

Schatz,³⁹ of Berlin, presented the case of a young girl 16 years of age, in whom there was complete bony occlusion of the posterior nares, the partition being sufficiently thin, however, to enable the observer to see light reflected from behind the palate through it. Cases of complete osseous occlusion were reported at the Wiesbaden Congress by Hoppman.³⁹ Keimer³⁸ and Gottstein reported another which was treated with the dental drill. Meyerson⁴⁷ reports a case in which the naso-pharyngeal orifices were completely occluded by a thin membrane which, when examined rhinoscopically, appeared to form a continuation of the membrane of the wall without choanæ. The patient could only breathe through the mouth. The membrane was opened by means of galvano-cautery, and the aperture thus made enlarged and kept open by means of rubber bougies.

Congenital occlusion of the anterior nares is an extremely rare condition, Jarvis having only been able to find one case in the literature of the subject (that of Delstanche). Congenital occlusion of the posterior nares, even when not due to complete deviation, is shown by the above array of cases not to be as rare a condition as generally thought.

Two points of interest mark five of the cases,—the fact that hearing was perfect in each; this contributing markedly to defeat Toynbee's opinion as to the effect upon the drum membrane of the suction produced by deglutition in persons in whom occlusion of the nares exists.

A point of analogy presented by four of the cases is the comparative thinness of the occluding wall, which, associated with the same condition in the majority of the cases reported before, tends to warrant a certain degree of facility in conducting operative procedures.

HAY FEVER.

Etiology and Pathology.—Nothing of much importance has been added to our knowledge of the etiology of this affection during the past year. Although exceedingly interesting, the discussion at the annual meeting of the American Laryngological Association elicited nothing but the fact that the divergence of

opinion still exists between those who consider the affection as a pure neurosis, with a periodical exacerbation, and those who ascribe the disease primarily to an irritation of the nasal mucous membrane. Abroad, Sir Andrew Clark,⁴¹ in a lecture upon hay fever, discussed its pathology, accepting the three great factors which have been brought forward as causal agents,—(1) nervous constitution or idiosyncrasy, sometimes inherited and sometimes acquired; (2) a local condition of irritability, which he defines as being of a sort which involves the nervous, vascular, lymphatic and cellular constituents of the affected parts, which when excited disturb the chemical, morphological and secretory functions; (3) external exciting or determining causes: any agent capable of calling into action the irritability of the parts concerned. He regards them all as co-operating in the development of an attack, at the same time admitting that there are some remarkable exceptions to the general rule. In the opinion of the editor, this is a most logical résumé of the question, a happy blending of theories which all possess merit, but which, taken singly, meet but a small proportion of cases. Interesting, connected with the pathology of the disease, is the case of a correspondent of the *Lancet*, who, until the age of 56, suffered from hay fever. At that period of his life the disease suddenly disappeared, and with it the sense of smell. The association of this sense with hay fever was alluded to by Morgan, of Washington, at the 1886 Session of the American Laryngological Association, in the form of a question to his fellow-members.

Treatment.—Sir Andrew Clark also stated that constitutional treatment, although not useless, is never by itself successful. The same may be said of general treatment conducted between the periodical attacks, as evidenced by the total inability to cope with the disease, before Daly, of Pittsburg, referred to the clinical importance of the nasal element in the affection.

Among the palliative remedies suggested during the year, antipyrine and antifebrine are the only ones that may be considered as new. Dr. Cheatham,⁴⁹ of Louisville, Ky., recommends antipyrine in the highest terms, in rose cold as well as hay fever, in daily doses of 10 to 30 grains. Used in a large number of cases, its effects were alike in all. He also tried antifebrine with about equal results, giving from 4 to 6 grains daily. Dr. A. Bloch,⁵⁰ of

Havre, also obtained excellent results from antipyrine. The *modus operandi* of the drug he believes to be a special action on the encephalic nerve centres, causing the hyperæsthesia of the mucous membrane to disappear. Peroxide of hydrogen, one part to three of warm water, injected into the naso-pharynx with a post-nasal syringe, is recommended by Dr. S. W. Ingraham.⁵¹ Dr. Seth N. Bishop,²⁴ of Chicago, in an essay which well merited the prize accorded him by the Hay Fever Association, reports excellent results from the use of atropia and morphia combined, gr. $\frac{1}{300}$ to $\frac{1}{100}$ of the former and gr. $\frac{1}{8}$ to $\frac{1}{2}$ of the latter. He adds: "If carefully adapted to any given case, I do not believe one need fail to prevent an attack or modify one already begun." Dr. J. H. Moorhead⁴¹ reports considerable relief from hypodermic injections of morphia tartrate twice daily, in doses of gr. $\frac{1}{20}$, gradually increased to gr. $\frac{1}{10}$ three times daily,—a dangerous measure to recommend to patients, for obvious reasons. Sir Andrew Clark advocates a mixture composed of glycerine and carbolic acid 3j, hydrochlorate of quinine 5j, and $\frac{1}{2000}$ part of perchloride of mercury. This requires heat to dissolve the quinine. The remedy is applied to the nostrils by means of a camel's hair pencil. Sir Morell Mackenzie advises the daily passage of a nasal bougie after the use of cocaine.

As to the treatment by galvano-cautery and other caustics, a number of contributions have appeared, principal among which is that of Dr. Roe,²⁶ of Rochester, in which he gives an analysis of 44 cases treated by him, and reiterates his views, the principal one of which is "that all cases of hay fever have their initiatory lesion in a diseased condition of the nasal fossæ." 36 of the 44 cases were cured. Of the remaining, 4 were not relieved owing to imperfect treatment, due to neglect of the patient, and 4 were lost sight of. Of the 36 who were cured, 20 have remained exempt from the first year of treatment to the present time, periods ranging from nine years to one year. The remaining 16 of the 34 were subsequently slightly troubled, but yielded to treatment. He had not obtained satisfactory results by superficial cauterization of the membrane, advocated by the editor some years ago. Dr. L. P. Klingensmith⁵⁰ reported 9 cases of cure out of 13 treated, the rest being greatly benefited.

The editor cannot present such favorable results, having

learned by experience that one, two, and even three years' immunity cannot be considered as cure, cases having returned to him after those periods suffering as much as ever, notwithstanding the fact that some of them had been treated in the manner described by Dr. Roe. During the last two years, however, the editor has had a series of cases which will, he believes, eventually pass at least the three-year test, through the fact that more care was taken in adopting in each the line of treatment best adapted to it. He has observed that cases uncomplicated by asthma, and in which no nasal disorder existed other than occlusion through engorgement of the turbinated bodies (and these form the majority), did best under glacial acetic acid (advocated in 1883), applied freely over the surface of the membrane, with one or two light applications of nitric acid to the turbinated bodies to control their erethism. Some cases treated in this manner have presented absolute immunity for the past 3, 4 and 6 years. (A 10 per cent. solution of cocaine, applied after drying the mucous surfaces with absorbent cotton, renders the application of glacial acetic acid almost painless; while the addition of cocaine to saturation to the nitric acid causes its employment to produce no sensation whatever.) For the application of nitric acid a convenient probe may be made by melting a piece of glass tubing in a gas-flame and dipping a heated probe into it. On cooling, a thin film of glass will be found over it, that will prevent the corroding action of the acid on the instrument. When there is true hypertrophy, marked septal deviation, etc., superficial applications of acids or cautery can only be palliative, radical measures such as those practiced by Dr. Roe, being peremptory to obtain a satisfactory result. Relative to the chances of success, the editor considers them least when marked asthma exists, especially in large, phlegmatic individuals. To assist the local treatment, Rabuteau's iron, gr. ij., and strychnia sulph., gr. $\frac{1}{60}$, gradually increased to gr. $\frac{1}{20}$, three times daily is begun with the local measures, about two months before the onset of the hay fever, while coca wine (Mariani's), a wineglassful one hour after meals, is ordered a few days before the paroxysm. He has further observed that some cases require two and even three courses of treatment in order to reach the state of absolute immunity.

Mr. George Stoker⁴¹ reported two successful cases in which

the cautery was applied "at the junction of the nasal bone with the cartilage of the nose, where the external branch of the nasal nerve passes between these structures to become superficial." Chatellier,³⁰ of Paris, reported favorable results in two cases cured by the use of the snare, the application of cautery, and chromic acid.

In addition to the internal medication, upon which he principally depends, Dr. J. N. Mackenzie, of Baltimore, makes a stellate incision with the galvano-cautery knife through the mucous membrane at the seat of greatest vascular disturbance. A cicatrix results, which binds down the turbinated tissues and prevents turgescence.

REFLEX NEUROSES.

Our Stockholm Corresponding Editor, Dr. Ecklund, mentions three cases reported by Dr. G. Finne,⁵² one of which, a case of neuralgia, is of special interest on account of its intensity. Medicinal treatment having been tried without avail, an atrophic rhinitis, from which the patient suffered, was thoroughly treated by chromic acid applications, the result being complete relief of the neuralgia. The two other cases were asthmatics, yielding also to local treatment.

Dr. Mygind, Corresponding Editor, of Copenhagen, gives an account of 32 cases of asthma, 2 of which were due to adenoid vegetations, and cured by the removal of these. The third case was caused by cauterization of the anterior portion of the septum.

Eyes.—In addition to the cases already reported, in which ocular symptoms were found to owe their origin to nasal affections, Cheatham,⁴⁹ of Louisville, reports a case of combined hypermetropia and presbyopia in which glasses afforded but slight relief, notwithstanding the efforts of several oculists. Eradication of nasal polypi by the snare and cauterization of engorged Schneiderian membrane by chromic acid, relieved all the symptoms referable to the eye. Two other cases are added, in which engorged turbinate bodies and polypi, respectively, caused imperfect vision, which was corrected by appropriate treatment of the nasal condition. Cheatham also states that he almost daily meets with cases of conjunctivitis and keratitis (especially the phlyctenular form) which do not yield to treatment until after an existing nasal catarrh or eczema of the nose is relieved.

Attention is also called to certain cases of glaucoma which have been relieved by stretching the nasal branch of the fifth, the theory set forth being that these cases may possibly be the result of chronic nasal disease.

Bettman,²⁴ of Chicago, reports six instances of marked reflex lachrymation and blepharospasm, in which the reduction of erectile turbinate tissue by galvano-cautery, eradication of polypi, etc., brought about complete recovery.

Vertigo.—Joal,¹⁰ of Mont Dore, read before the last meeting of the French Laryngological and Otological Association an interesting review of the subject, in which he added to the cases previously reported by Michel, Hack, Massei, Hering, Lefferts, McBride, Gennaro, and others, nine cases seen by himself,—four in his own practice, and the others in the practices of Drs. Fauvel, Cadier and Ruault. Gastric and aural causes were sought after and not found, while the cessation of the vertigo (generally gyratory), after appropriate treatment of the nasal trouble, further demonstrated its nasal origin. The several varieties of rhinitis, mucous polypi (especially small and movable ones), are the principal factors, all the latter belonging to the class of affections presenting little or no danger to life. Adults are more liable to this reflex neurosis than children or old people. The attack may come on at any time of the day, but is most liable to occur on awakening in the morning, through the added pressure of accumulated discharges.

A correspondent of the London *Lancet*, signing himself H. D. F., reports in this connection the interesting fact that as a sequela of hay fever, which had suddenly left him some time before, he experiences now and then “a subjective, unearthly, not unpleasant sense, passing into vertigo and momentary unconsciousness.”

Clonic spasm of the soft palate and of the Eustachian tube in a lady 28 years of age is reported by Seiffert,⁵³ due to catarrhal affection of the nose, which chromic acid failed to relieve. Michael³³ reports a similar case in a lady 40 years old, who had nasal polypi, in whom the Eustachian tubes had been accidentally burned by the galvano-cautery during unsuccessful attempts at removal. Clonic spasm of the Eustachian tubes with an objective and subjective crackling noise lasted until some time after the removal of the polypi.

Spasmodic Sneezing.—S. Solis Cohen⁴¹ reports a case of hysterical sneezing which was cured by the application over an extremely sensitive spot upon the septum of a continuous battery current, the positive pole being applied in the nostril and the negative upon the cheek. At first five Daniell's cells were used; then twenty, the length of the sittings being one minute at first, and gradually increased to five. Another case of hysterical sneezing is reported by Bobone,⁵⁴ with favorable results by means of buginaria of iodoform and cocaine.

Dr. de Havilland Hall reports that a query in the *British Medical Journal* for a hint in the way of a remedy for a most severe case of sneezing, elicited several replies. Internally, arsenic, either in the form of the iodide or the liquor arsenicalis appeared to be a general favorite. One writer regarded the symptoms as of gouty origin, and combined bicarbonate of potassium with the arsenic and blue pill with rhubarb or colocynth. Locally, Ferrier's snuff (hydrochlorate of morphine, gr. $\frac{1}{2}$; powdered acacia, 5ss; subnitrate of bismuth, 5iiss); a combination of cocaine, carbolic acid and essence of camphor dissolved in water, to be syringed in the nostril; a saturated solution of camphor in spirit painted with a camel's hair brush up the nostril and over the alæ of the nose.

DEFLECTIONS OF THE SEPTUM.

Etiology.—The etiology of deflections was studied by Bryson Delavan,²⁶ of New York, in an admirable paper read before the American Laryngological Association. Quoting Watson as to the lack of development of the nasal fossæ in the newborn, in which the vomer is alone ossified, while the cribriform plate is but a membranous plane, he infers that in the infant the septum is one of the last parts to assume its ultimate form. The delay in the general development of the fossæ is followed later by a sudden activity of growth involving consequent inequality of development, this occurring probably not before the age of seven years. The septum, of irregular construction, osseous and strong in its posterior aspect and weak in its anterior, surrounded by unyielding walls and held firmly between the ethmoid above and the hard palate below, bends in the direction of least resistance as the growths proceed, and the various parts being pushed aside from their various planes, a so-called congenital deflection results.

Among the predisposing causes race is particularly interesting. In the European, 50 per cent. present more or less marked deviation, the Slavonic and Hebrew races furnishing the highest proportion. Although the aquiline type of nose is particularly apt to present deflection, as illustrated in those races, it is strange that the American Indian, in whom this shape is characteristic, is freest from deformity. The Grecian type also frequently presents deflections, while both types mentioned are often associated with a high-arched palate. Among primitive types deformities are rare, while in the highly civilized they are almost the rule, catarrhal conditions due to surroundings being an important factor. Scrofula, syphilis, etc., are also potent elements in the etiology of deflections.

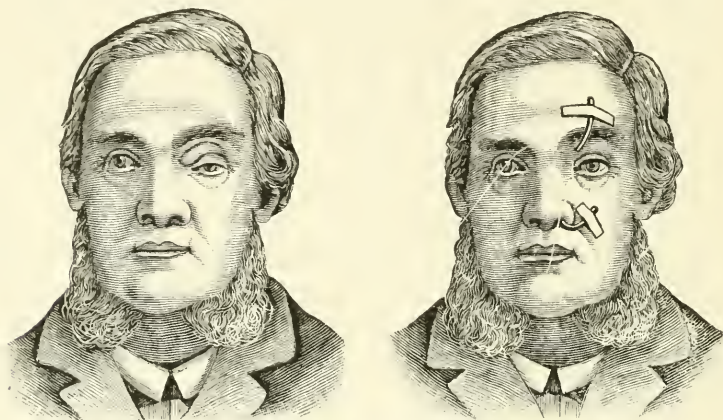
As to traumatism, the series of 227 cases examined by Robertson, of Detroit, showing 83 clear cases of injury, while half of the rest presented clear evidences of fracture and dislocation, leads him to conclude that deflections are due, as a rule, to trauma. Robertson's list further demonstrates that a large proportion of the deformities manifest themselves between the ages of 10 and 20,—a period of great constructive activity.

Local malnutrition, suggested by Ingals, of Chicago, in 1882, is considered as an important factor, especially in the formation of the bony spurs, crests and ridges frequently found at the junction of the vomer. Asymmetry of the nasal fossæ is also accepted as a cause. Stenosis of one nasal fossa may, by the withdrawal from that fossa of its proper nutrition, cause inharmonious development of that one as compared with its fellow, a view strengthened, according to Ziem, by the results obtained by excluding the entrance of air from one nostril in young animals, in which there was developed general inequality in the relative positions of integral parts. Delavan further expresses his belief in the production of deflections through the occlusion of one nasal fossa in a growing child by hypertrophy, adenoid growths, etc., and by the mouth-breathing occasioned by complete occlusion of the nose, the septum in this case being subjected to the pressure of the hard palate, which is in turn subjected to the atmospheric pressure below through the vacuum in the nasal cavities caused by the act of respiration.

At a meeting of the Berlin Surgical Society, von Volkmann¹² stated that he had formerly considered all deflections as due to

trauma; but that he had now come to the conclusion that very few cases could be ascribed to this cause, the majority being due to arrest of development.

Treatment.—No new operation has been suggested, the measures advocated in the several papers written on the subject being but personal appreciations of the procedures generally known. Some valuable improvements have been made, however, upon appliances already in use. W. C. Jarvis²⁶ contributes an ingenious device calculated to replace the common treadle surgical engine, in which the drills are revolved by an electric motor. H. H. Curtis²⁶ also contributes a valuable arrangement for the same purpose in which the drills present a tubular shape, their circular tips being furnished with teeth. This instrument presents several



ABSCESS OF FRONTAL SINUS.—(*Canadian Practitioner.*)

happy features. The use of the saw has been further extolled by Bosworth,⁵⁵ who reports a large number of cases treated successfully with it. Roe presented at the last meeting of the American Laryngological Association an electric saw, in which the rapidity of motion secured proved of advantage in many particulars.

ABSCESS OF FRONTAL SINUS.

Dr. R. A. Reeve,⁵⁶ of Toronto, in reviewing our knowledge of this affection presented the above cuts which give an excellent representation of the appearance of a patient suffering from this affection:—

Jurasz¹² reports several cases in which he was able to introduce into the frontal sinus a metal probe, fine and slightly knobbed.

The anterior part of the infundibulum is the site of the opening, and the probe should be pushed gently in that direction until a comma-shaped rim rounded off upwards will be met,—the entrance of the cavity. The length of the canal is 12 to 16 mm., its direction being either outwards or inwards. The value of this procedure in purulent inflammation of the membrane of the sinus is self-evident.

ABSCESS OF THE MAXILLARY SINUS.

Etiology.—An interesting discussion took place at the meeting of the French Otological Society, in which Schiffers, of Liège, Belgium, expressed the opinion that disease of this cavity was more frequently the result of nasal catarrh than of dental caries. The frequency of the latter and the rarity of antral inflammation seemed to render this view tenable. The majority of those who took part in the discussion, including Gouguenheim, Baratoux, Chatellier and Poyet disagreed with the lecturer. B. Fränkel¹² also offered his view, insisting, however, on the advisability of always examining the nose.

Diagnosis.—Luc⁵⁷ insists upon the importance of intermittent fetidity of the breath, in differentiating from ozæna, in which the offensive odor is continuous. Another point of importance is that the discharge is unilateral, whereas in ozæna it is usually bilateral. A prolonged discharge from the antrum may be indicative of a malignant growth as illustrated by a case reported by McDeane and Misbet.⁴¹ The pain is usually much more severe, however.

Treatment.—Combe,⁵⁹ of Paris, advocates the extraction of teeth and thorough drainage. Through the nasal opening he injects antiseptic solutions followed by insufflations of iodol. This drug causes almost immediate cessation of the fetid odor, and its alterative action soon modifies the character of the secretions. Fletcher Ingals, of Chicago, recommends a spray or small injection of peroxide of hydrogen, three or four times a week, and a wash of listerine 5ss to ʒj of saturated solutions of boric acid, lukewarm, used twice a day.

Dr. Frontis,⁵⁶ Wadesborough, N. C., reports two interesting cases, in one of which there was reflex cough, while in the other cough was the most alarming symptom, this disappearing in both cases after appropriate treatment.

Miculicz,⁶⁰ considering the many difficulties met with in reaching the antrum from the middle meatus, made an opening from the inferior meatus by means of a suitably bent knife, which rendered all subsequent measures much easier and hastened the cure markedly in four cases.

NASO-PHARYNGEAL CATARRH.

Pathological Anatomy.—Schwabach,⁶¹ of Berlin, furnishes an interesting paper, giving the results of a series of investigations upon the cadaver, conducted with a view to determine the true character of the bursa pharyngea,—a small orifice situated in the roof of the pharyngeal vault, a short distance behind the upper portion of the septum, and considered by Tornwaldt,⁶² of Danzig, as the seat of post-nasal catarrh in most cases. Schwabach is of the opinion that the bursa is not a special anatomical formation, as regarded by Tornwaldt, and that it is but an integral portion of the pharyngeal tonsil, taking part in the diseases to which the latter is subject, but not possessing a pathological character of its own. He thus agrees with Ganghofner,⁶³ who, in 1878, denied the existence of the bursa pharyngea in the form represented by Luschka,⁶⁴ and describes it himself as a simple, more or less marked depression of the mucous membrane, having no great depth, and not connected with the basilar process, as claimed by Luschka, by means of a strip of cellular tissue.

Besides the one hundred and odd adult heads examined, Schwabach employed twenty-eight children's and two foetal heads, selected with a view to anticipate the presence of local disease. In these he found the configuration described by Wendt,⁶⁵ then by Ganghofner, *i.e.*, a series of irregular, deep and shallow clefts, forming ridges of various heights and breadths, which gradually disappear as age advances. This progression is, to a certain degree, shown in the first of the annexed plates, while in the second the bursa, as it is frequently seen in the adult, is presented. Below this figure the naso-pharynx of a newborn is shown, in which the bursa could already clearly be depicted. A sagittal section is also shown. In ten of twenty-three preparations examined with that point in view, Schwabach found more or less defined evidences of the original clefts in ten, and in these the *middle* cleft was the one partially or completely retained, while a few showed a number



Burk & McEvedy, Lith. Phila

The Pharyngeal Bursa. (Schwabach)

From the Archiv f Mikrosk Anatomie.

Max Cohen & Son, Pub Bonn

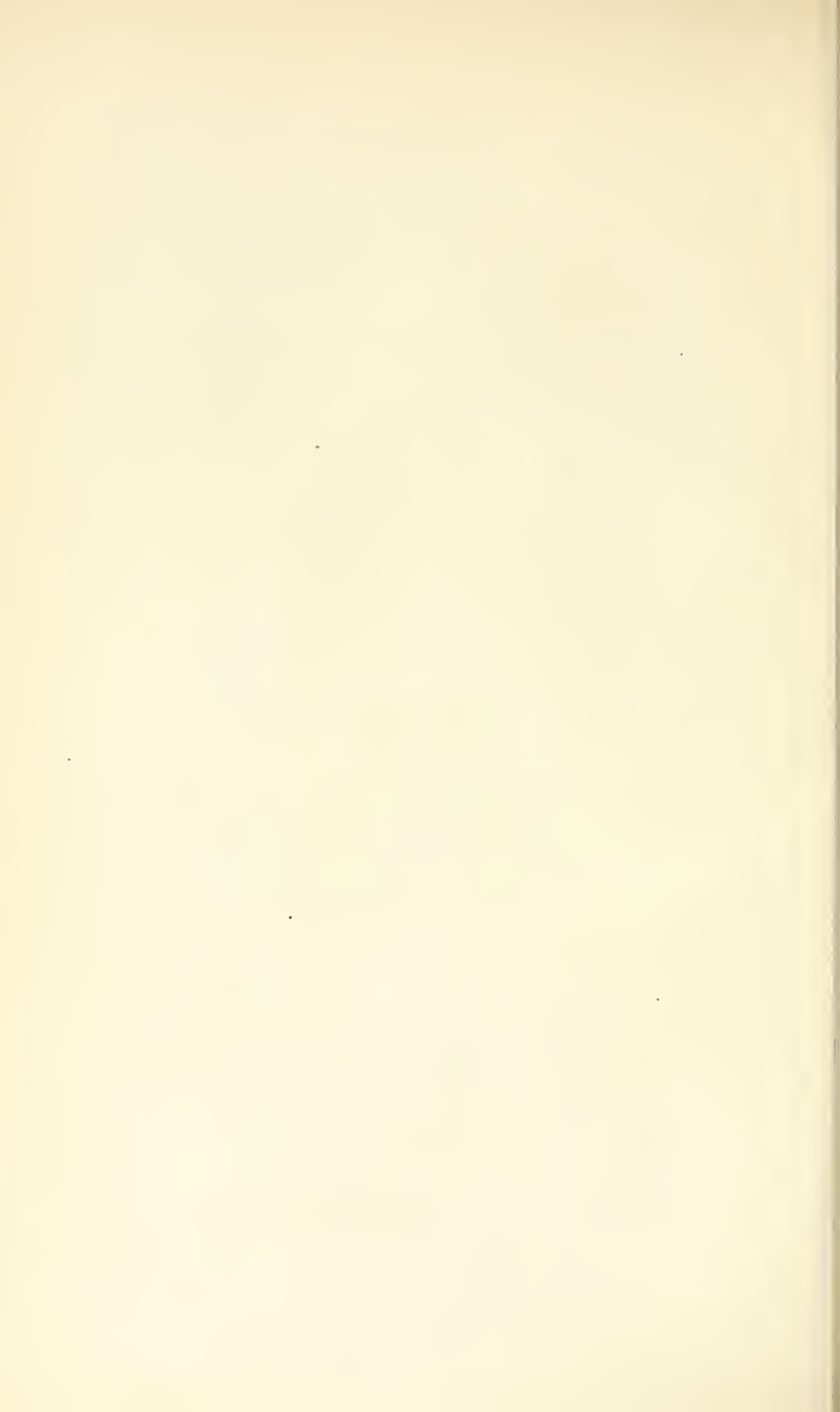


Fig. 4.



Fig. 5.



Fig. 6.



Fig. 7.



Fig. 8.

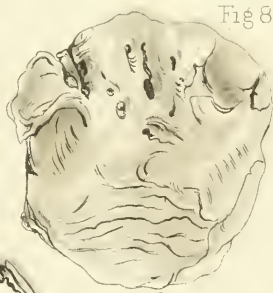


Fig. 9.

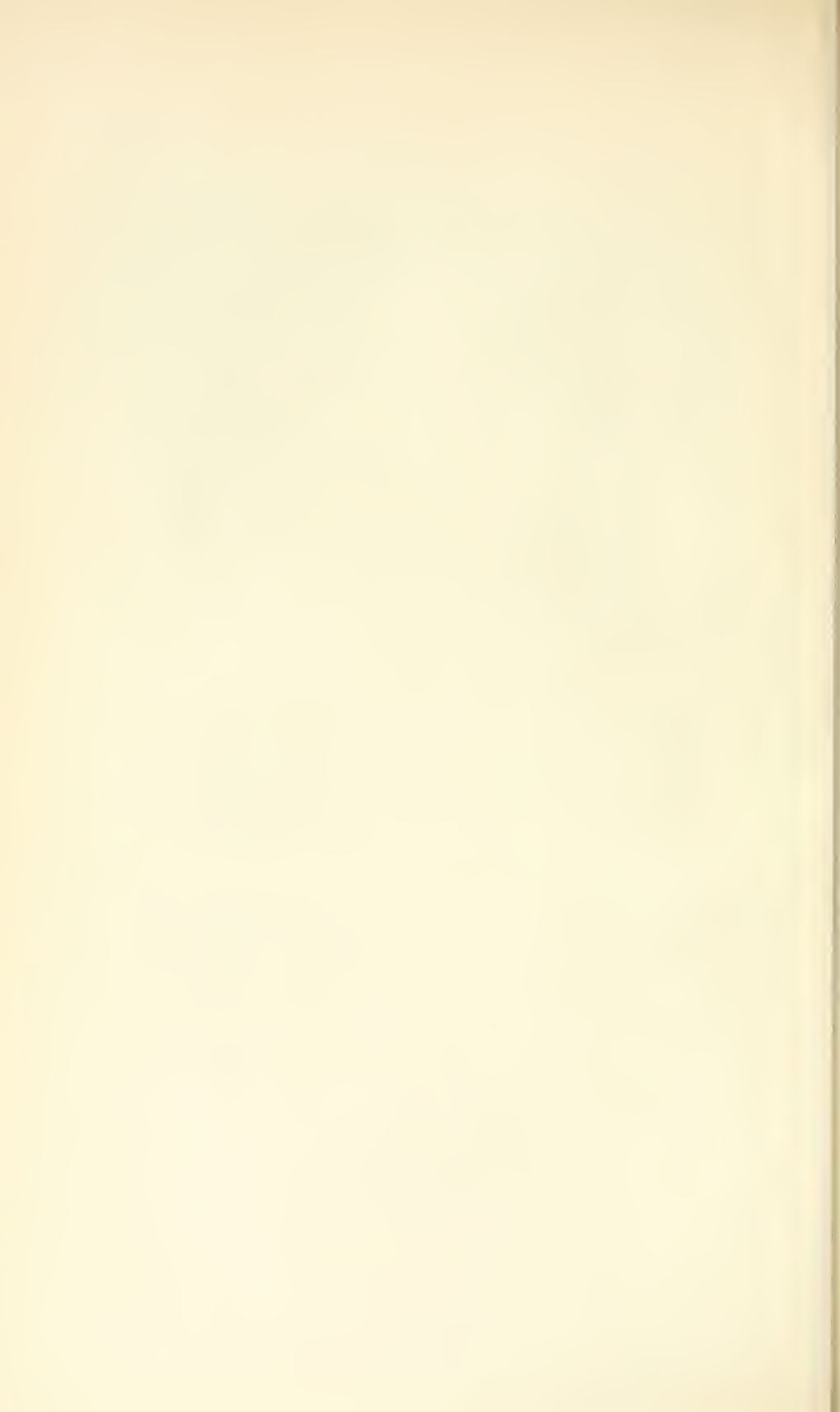


Birk & M. F. Fritzsche, Lith. Phila.

The Pharyngeal Bursa, *Silviusbach*.

From the Archiv f. Mikroskop. Anatomie.

Max Schenk, in Frib. Esser.



of openings of varying size. The bursa of Tornwaldt, therefore, is but the remnant of the middle cleft, the "purse" or blind pouch being its posterior end, formed by the partial agglutination of its margin.

Trautmann, according to Bresgen,¹⁴ recalled the fact that various authors, relying solely upon rhinoscopic examinations, had arrived at erroneous conclusions when studying the hyperplasiæ of adenoid vegetations, and that these differed completely from those arrived at when the studies were conducted upon the cadaver.

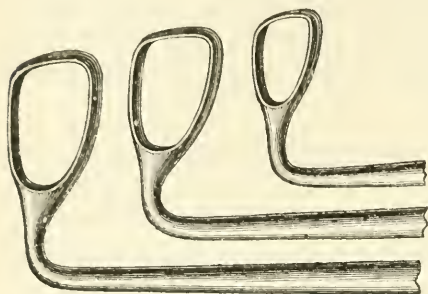
This can be well applied to the present discussion on the subject, with reference, however, in a certain sense, to the histologist as well as the clinician. The researches of Schwabach, coupled with those of Wendt, Ganghofner, Trautmann, and others, doubtless demonstrate the correctness of his views; but the attestations quoted by Tornwaldt,—Keimer,⁶⁶ Broich,⁶⁶ Tissier,⁶⁷ Luc,⁶⁸ Zahn,⁶⁹ Massuci,⁷⁰ and those of Morgan,⁷¹ Gradle,⁷² Schmiegelow,⁴²—while by no means enthusiastic, nevertheless furnish evidence as to the clinical importance of his studies. Combining the evidence of both sides, a natural solution of the problem would be, that although the bursa pharyngea does not present histological characters of a nature to make it liable to pathological conditions differing from those of the pharyngeal tonsil, its location and conformation render it subject to disorders that may present a character of their own, and differing entirely from those of the pharyngeal tonsil proper.

Treatment.—Iodol has shown some beneficial action, insufflated pure. Dr. John Gordon,⁴¹ of London, says that it has local anæsthetic properties, and that where there is much discharge it acts as an astringent. Our correspondent, Dr. de Havilland Hall, recommends it as a spray or brush application when atrophy complicates the case.

The bursa of Tornwaldt, accepted as such by some, has been treated with more or less satisfactory results, while the majority report a rather small proportion of cures of the so-called "post-nasal catarrh," of which it is supposed to form an important element. No less an authority than Schmiegelow,⁷³ of Copenhagen, reports three cases in which there was obstinate catarrh, cured by cauterization of the bursa.

ADENOID VEGETATIONS.

Our Corresponding Editor, Dr. Major, of Montreal, describes a new adenomatome which consists of a sliding guillotine, capable of removing, at a single sitting, any growth in the upper surface (roof) of the vault of the naso-pharyngeal cavity. The instrument



HARTMANN'S CURETTE.—(*Monats f. aerztl. Polytech.*)

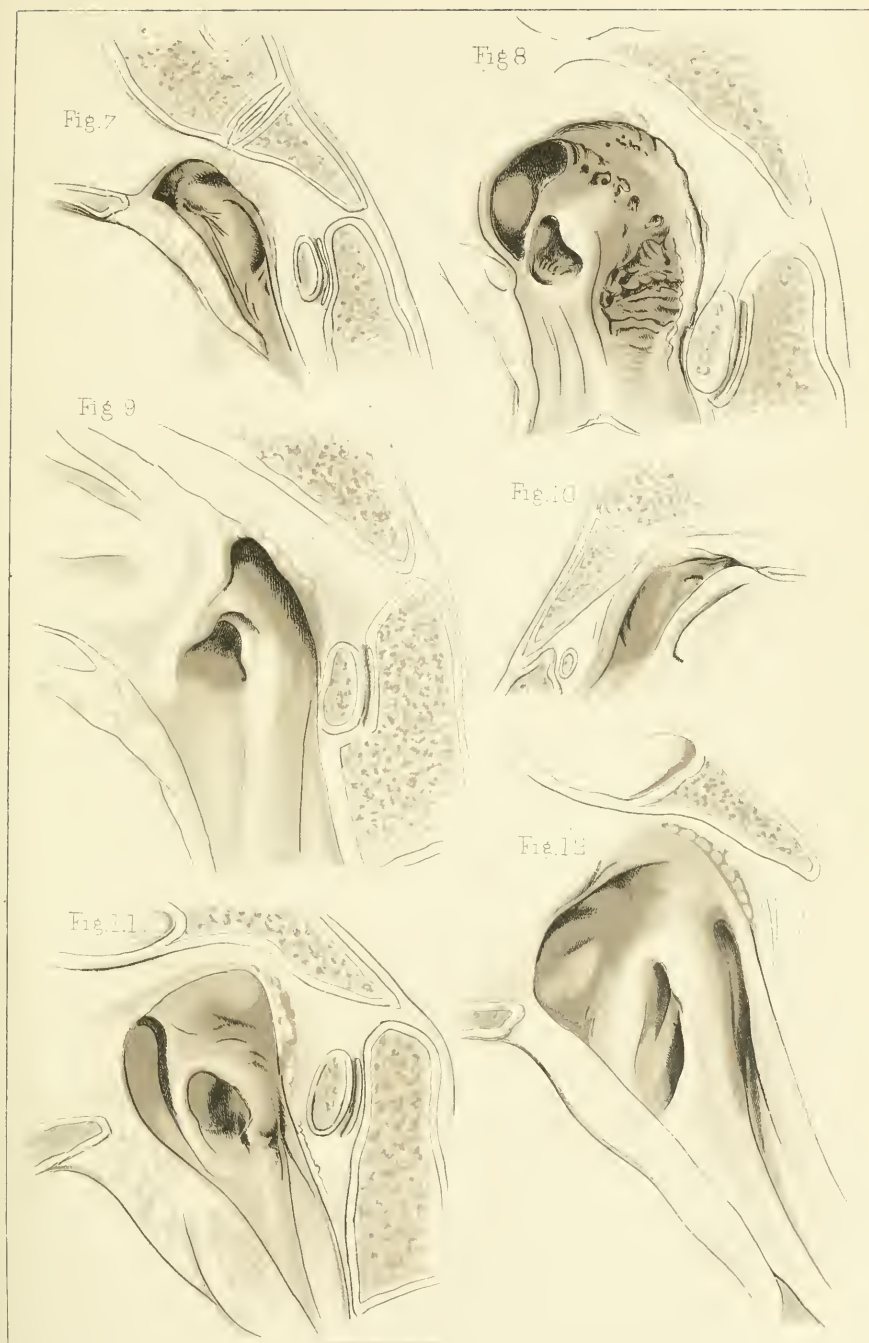
is not applicable to the removal of growths on the posterior wall. Accompanying an interesting review of the subject, our Corresponding Editor, Dr. Arthur Hartmann, of Berlin, described the instruments shown in the cuts,—a modification of Guy's ring-knives.

In an article describing a new instrument for the removal of adenoid growths, Löwenberg¹⁴ remarks that it is not necessary to extirpate the entire mass, the remnant gradually disappearing through a process of atrophy. His instrument consists of a knife protected by a shield, which enables the operator to include precisely the part he wishes to remove. Exceedingly suggestive in this connection are the plates presented herewith, which accompany an admirable paper by Casimir von Kostanecki (61) on the relations of the Eustachian orifice and the pharyngeal vault; and giving the relative dimensions of the sundry parts. In Figs. 1, 3, 5 and 6 (Plate I), and 2, 5 and 6 (Plate II), for instance, extensive adenoid vegetations would be required to influence mechanically and to any degree the Eustachian orifice; while the extirpation of a small portion of the mass would suffice to procure relief, and eventually restore the parts to their normal condition. Not so, however, with the vaults shown in Figs. 1, 3. and 4 (Plate II), in which a limited growth would suffice to greatly compromise the physiological functions of the Eustachian tubes. Even a large mass here would require complete extirpation to insure immediate relief.

REFERENCES.

1. La Semaine Méd. 2. Med. Press and Circular. 3. Trans. Paris Acad. Méd.
4. Präger Med. Woch. 5. Med. News. 6. Ann. d'Oculistique. 7. Thèse de Bordeaux.
8. El Dictamen. 9. Personal Communication. 10. Revue Mens. de Laryng.
11. Jour. de Méd. et Chir. 12. Berlin Klin. Woch. 13. Phila. Med. Times. 14.





Burk & M^cFarbridge, Luth. Phila

The Eustachian orifice and its relation to the Pharyngeal Vault. (Von Kossel & P. H.)

Ph. in the Archiv f. Mikrosk. Anatomie

Max. v. Kossel & P. H. Born



- Deut. Med. Woch. 15. Trans. Phila. Co. Med. Soc. 16. Jour. de Méd. de Bordeaux. 17. Arch. Ital. di Laryng. 18. Bull. d. l. Soc. Anat. 19. Daniel's Texas Med. Jour. 20. Lancet. 21. Revue Méd. d. l. Suisse Romande. 22. Revue de Chir. 23. Cent. f. Prakt. Aug. 24. Jour. Am. Med. Assoc. 25. Wien. Med. Presse. 26. N. Y. Med. Jour. 27. Liverpool Med. Chir. Jour. 28. Le Progrès Méd. 29. Glasgow Med. Jour. 30. La France Méd. 31. Cinn. Lancet-Clin. 32. Lyon Méd. 33. Vratsch. 34. Cron. Med. Chir. d. l. Habana. 35. Jour. of Laryng. 36. Revue Mens. des Mal. de l'Enf. 37. Albany Med. Annals. 38. Allg. Med. Cent. Zeit. 39. Deut. Med. Zeit. 40. Pesther Med. Chir. Presse. 41. Brit. Med. Jour. 42. Hospitaltidende. 43. l'Union Méd. 44. Ann. des Mal. de l'Oreille. 45. Australasian Med. Gaz. 46. Buffalo M. and S. Jour., 1886. 47. Medycyna. 48. Trans. Wien. Med. Doct. Coll. 49. Am. Pract. and News. 50. Med. Register. 51. Chicago Med. Times. 52. Norsk. Mag. f. Lægr. 53. Inter. Klin. Rundschau. 54. Bolletino Prazzi. 55. Med. Record. 56. Canadian Pract. 57. Jour. de Méd. de Paris. 58. Am. Med. Digest. 59. Revue de Thér. 60. Arch. f. Klin. Chir. 61. Arch. f. Mikr. Anat. 62. Ueber der Bedeutung der Bursa Pharyngea für die Erkennung und Behandlung gewisser Nasenrach-enraum-Krankheiten. 8^o Bergmann, Wiesbaden, 1885. 63. Ueber die Tonsilla und Bursa Pharyngea., Sitzungs-b. der k. Acad. d. Wissensch. Bd. lxxviii. 1878. 64. Der Schlundkopf des Menschen, Tübingen, 1868. 65. Krankheiten der Nasenrachenhöhle und des Rachens, Ziemssen's Handb. der Pathol. und Therapie. 66. Monat. für Ohrenheilk., 1886. 67. Ann. des Mal. du Larynx., 1886. 68. La France Méd., 1886. 69. Deut. Zeit. f. Chir. 70. Inter. Cent. f. Laryng., 1886. 71. Maryland Med. Jour. 72. Chicago Med. Jour. and Exam. 73. Report of Dr. Holger Mygind, Corr. Ed.

[Undated references apply to journals published in 1887, and original articles can be found by consulting the indexes of the respective publications.]

DISEASES OF THE PHARYNX.

BY D. BRYSON DELAVAN, M.D.,

NEW YORK.

ANATOMY.

Pulsating Arteries at the Posterior Wall of the Pharynx.—

Farlow¹ reports five cases in which a large, pulsating artery was plainly visible upon the posterior wall of the pharynx. All the patients were females, and the pharynx was atrophic, the mucous membrane being thin, dry and shining. The vessels seemed to be the ascending pharyngeal arteries from their position on the superior constrictor and their vertical direction, and, inasmuch as mention is made of the increased size of the vessel when the ascending palatine is small, it is possible that the latter vessels in the above cases were unusually small. In order to avoid wounding such enlarged vessels Farlow thinks that digital exploration should always be made before the performance of any surgical operation upon that part of the pharynx.

Pulsating Veins of the Pharynx.—Cresswell Baber and Sanderson² each report a case similar to the above.

On the posterior and lateral walls of the pharynx a network of veins exists, having very unequal meshes. The principal efferent vessels empty themselves into the internal jugular veins, and communicate superiorly with the pterygo-palatine vessels,—median and posterior meningeal. The plexus is the terminal for numerous veins which proceed from the muscles, and especially of the mucous coat of the pharynx, beneath which they form the submucous network. Bimar and Lapeyre³ have specially studied this network, which is found to present at the level of the inferior part of the posterior wall of the pharynx a very remarkable deep plexus, not described by authors, and merely mentioned by Cruveilhier. It is constant, and met with at all ages. It exists between the mucous coat in front and the inferior constrictor muscle behind, whilst the inferior angle of the middle constrictor

partially conceals it. Irregularly oval in shape, its larger extremity is superior. It is composed of an agglomeration of a large number of veins ranged one against another, frequently anastomosed; and into it run veins from the pharyngeal mucous membrane, which form fine arborizations around it.

Angiomatous tumors, one of the pharynx and one of the palate, are reported by Wolfenden⁴ and Duret⁵ respectively.

PHARYNGITIS.

Pathology.—Le Lue, after a careful study of Thornwaldt's theory that in many cases of chronic disease of the pharynx the principal cause is an inflammatory condition of Luschka's tonsil, and that treatment of the vault of the pharynx is followed by excellent results, concludes that (1) chronic pharyngitis characterized by dryness of the pharyngeal walls and the presence of crusts and mucus, is likely to co-exist with catarrh of Luschka's gland; (2) energetic cauterization of the pharyngeal bursa with the galvano-cautery puts an end to the local catarrh, and thus expedites the cure of the secondary pharyngitis; (3) the coexistence of signs of true ozæna does not contra-indicate the direct treatment of Luschka's gland.

Moure⁶ suggests that the atrophic changes found in dry catarrh of the pharynx affect not only the mucous glands, but also the subjacent muscular tissue. Seiss⁷ believes that chronic pharyngitis, not syphilitic, tubercular, or gastric in character, is always dependent upon intra-nasal disease, and that the so-called "varieties" of chronic sore throat are simply stages of an inflammatory disease, which in turn are generally dependent upon the stage of intra-nasal inflammation present in the case. The sequence is so well marked and reliable that a fair diagnosis of the pharyngeal condition may be made from an examination of the anterior nasal space.

Downie⁸ believes that the excessive use of tea, taken very hot and strong, may result in the production of a dry condition of the pharynx which is local and not dependent upon atrophic rhinitis.

ATROPHIC PHARYNGITIS.

Delavan⁹ calls attention to the method advocated by Shurly, of Detroit, namely, applications to the atrophied mucous membrane

of the naso-pharyngeal space of the galvanic current. He reports good results. The current should be applied by means of an electrode made of copper wire covered with absorbent cotton. This, saturated with tepid water, conveys the electric current with thoroughness and ease.

ERYSIPELAS OF THE PHARYNX.

Cases of this disease are reported by Wells,¹⁰ Delavan¹¹ and Stern,¹² while Henning reports five, and Bedford Brown¹⁴ two. The latter urges the importance of counter-irritation, applied to the neck and chest for the purpose of inducing a migration of the inflammation,—a recommendation not wanting in merit. The well-known dictum of Hippocrates, that when erysipelas extends from within outward it is a favorable symptom, but when it removes to the internal surfaces it is a deadly one, has been confirmed by modern observation. Measures calculated to encourage the former process, therefore, should not be disregarded. Henning has used the following with an atomizer, having the patient inhale as much as possible during the process of spraying:—

R. Ext. veratr. virid. fld.,	. . . . .	gtt.xx
Ext. aconit. fld.,	. . . . .	gtt.x
Tr. ferri chlor.,	. . . . .	ʒi
Aquæ,	. . . . .	ʒiv.—M.

Sig.—Half a teaspoonful every half hour.

TUBERCULAR PHARYNGITIS.

Ariza¹⁵ describes a case of this kind occurring in a young physician. Several small red growths sprang from an ulcerated surface on the anterior pillars. Two or three whitish granules, of the size of a pin's head, were seen on the pharynx and another on the base of the uvula. The patient was in delicate health, aphonic, and suffered greatly from odynphagia. Tubercle bacilli were abundant and, although the appearances were by no means typical, the diagnosis of acute tubercular pharyngitis was adopted. Ariza infers from this case that (1) acute miliary pharyngitis is rare; (2) there may be exceptions to the rule that the course of the disease is progressive and its termination fatal; (3) the appearance in different localities of the lesions may not correspond in point of time to the classical descriptions which have been given; (4) it is curable.

From the observation of a very considerable number of cases of this disease, the editor is unable to concur with propositions (2) and (4) of the above. If it be curable, it is only so through the agency of some plan of treatment at present unknown in this country.

Cases are also reported by Lennox Browne¹⁶ and by Uehermann,¹⁷ the latter describing a patient in whom the velum palati was the seat of ulcerations, matter from which, examined under the microscope, showed the characteristic bacilli of tubercle. There was no involvement of either the larynx or the lungs. The ulcers were completely cured by applications of carbolized glycerine, iodine and iodoform. Other cases are reported by Malensten,¹⁸ Lubinski,¹⁹ Baginsky²⁰ and Van Santvoord.²¹

SYPHILITIC PHARYNGITIS.

Cases of primary buccal syphilis are reported by Malensten²² and Haslund.²³ Hobbs²⁴ reports a case in which exposure of the anterior column of the spinal cord occurred from syphilitic ulceration of the upper pharynx. The patient, evidently a victim of syphilis, while under treatment for an extensive ulcer of the pharynx, began to complain of constant pain in the back of the neck and head. At the end of a week from the appearance of this pain, and during the cleansing of the ulcer upon the posterior wall of the pharynx, a probe was pressed to its bottom, when suddenly one-half of the patient's body became paralyzed, his head fell to the right, his right leg turned outward, and he would have fallen from the chair had he not been held. Without losing consciousness at any time, this hemiplegic condition lasted about thirty seconds, when, as he expressed it, he "felt a tingling in the right half of his body," and in another half minute, slowly raised the right half of his body into position.

The next day the same phenomena were repeated, only on the opposite side. During the following week his symptoms improved; paralysis of the side pressed upon was again exhibited, but in a much milder degree than before, and ending in the same tingling sensations as above described. Two weeks later the same pressure failed to produce paralysis, but resulted in violent choreic movements, always corresponding to the side of the pressure. These symptoms gradually subsided as the case progressed toward

recovery and finally disappeared. Previous to the appearance of the above neurotic symptoms, fragments of dead bone, amounting to about the size of an almond had been removed from that part of the ulcer adjacent to the spinal column.

Schumacher²⁵ has described certain changes observed in the pharynx of patients undergoing the inunction cure. He distinguished two forms,—acute and chronic,—both occurring independently of the ordinary mercurial stomatitis. The affection begins amongst the circumvallate papillæ of the tongue, and spreads backward on to the epiglottis, attacking more particularly the edges of the pharyngeal and epiglottidean mucous membrane, and passing downward at times to the entrance of the larynx. It occurs but seldom on the posterior wall of the pharynx. It appears at first only as a slight dullness, but in a few days snow-white deposits form, half to one centimetre in circumference, surrounded by a bright red zone. If the course be very severe, the glands swell, but ordinarily the whole of the lesions disappear gradually in from one to three weeks. The pain and inconvenience which it causes may be considerable.

The difficulty, of course, consists in diagnosing this from an early syphilitic lesion. Schumacher pointed out that it generally precedes the syphilitic eruptions, and that, moreover, a syphilitic eruption in this position is rare. It is undoubtedly likely to be confused with some similar syphilitic manifestations in the mouth, but that it is mercurial, and not syphilitic, Sommerbrodt²⁶ shows by quoting the case of an old bath proprietor who suffered from it whilst engaged in rubbing five syphilitic patients daily with gray salve. As treatment he used chlorate of potash, which rapidly proved successful.

PHARYNGO-MYCOSIS.

Articles upon this subject have appeared by Ferre²⁷ and Chiari.²⁸ The affection is not so rare as is supposed, and may escape observation because it is painless. It manifests itself in the chronic forms of follicular tonsillitis and in concretions of the crypts. A cure is easily effected by cauterization of the crypts. It is possible for the mycosis to be ingrafted upon an acute tonsillitis. It is found in the folds of the tonsil, between the pillars of the fauces and tonsil, and at the base of the tongue. The deposits are white or yellowish in color, more or less hard and confluent.

They may occur upon projections of the mucous membrane, but generally select the orifices of the crypts. There is no inflammatory action, either local or general, which distinguishes the condition from diphtheria and from follicular tonsillitis. The deposits quickly return when removed. Histologically speaking, the deposit is composed of filaments of *leptothrix buccalis*. Since the origin of this germ seems commonly to be due to carious teeth, the treatment of the latter should be of the first importance. The patches themselves should be destroyed with the galvano-cautery, and any suspected localities treated likewise. In the experience of the editor, the most valuable local application is a solution of mercury bichloride 1-2000.

NEUROSES OF THE PHARYNX.

Several important articles upon this subject (McDonald,²⁹ Huchard,³⁰ Rethi³¹) have appeared during the past year. Aside from cases of paralysis of the velum following diphtheria or due to central nerve disease, parietic conditions of the soft palate have scarcely received the attention they deserve. In the case of this particular paralysis, the affection may be defined as an enfeeblement of the levators of the palate, generally accompanied by more or less anæsthesia of its anterior surface,—at any rate, so far as tactile sensation is concerned. It is merely symptomatic, and in fact generally exists to a greater or less degree during the progress of inflammatory trouble in the neighborhood. It frequently accompanies post-nasal catarrh, and hence necessarily the various sources of this complaint: thus it is seen especially in retro-nasal adenoids and in posterior enlargements of the inferior turbinated bodies.

In acute inflammatory attacks both of the pharynx and nasopharynx, the paresis is always present to a greater or less degree, and accounts for much of the difficulty in speech usually observed. Finally, as an accompaniment of an elongated uvula, the symptom, although less marked, is seldom absent. The subjective symptoms are confined to faults of articulation, such as thickness of speech or the nasal quality common to those suffering from cold in the head. In connection with this paresis of the velum, there may be as well a weakening of the constrictors of the pharynx; and the patient may suffer not only from defective articulation, but

also from the so-called "functional dysphagia." Of neuralgia of the pharynx Rethi distinguishes three varieties: those of central origin, those due to irritation of the peripheral nerves and reflex neuralgias. He believes that cauterization of painful localities is indicated, not alone in peripheral neuralgias, but also in those which are apparently central, although in the latter cases he is unable to explain the reason.

The treatment consists in remedying the primary cause of the affection, shortening the uvula if necessary, and, above all things, giving increased tone to the muscular structures involved. The application of the faradic current, together with properly conducted gymnastics, are of great assistance. For the latter, frequent gargling and the singing of the higher notes of the scale have been found effective. An easy plan is to direct the patient to spend a short time each day in blowing soap-bubbles.

HYPERTROPHIED GLANDULAR TISSUE AT THE BASE OF THE TONGUE.

Much has been said of late concerning the above condition; and although the subject is by no means new, attention having been called to it several years ago by Llewellyn Thomas and Mr. Lennox Browne, considerable light has been thrown upon it during the past year. Following the able article of Swain,³² papers have appeared by Atkins,³³ Rice,³⁴ McBride,⁶⁹ Robertson,³⁵ Gleitsman,³⁶ Seifert,³⁷ Babcock³⁸ and Browne.³⁹

Pathologically these hypertrophies are analogous to hypertrophies of the tonsil, the tissues which compose both of them being identical. Both are due to the same causes. Clinically, hypertrophy of the lingual tonsil, as it is sometimes called, is attended with marked increase in the normal volume of the part, dilatation of the neighboring blood-vessels and greater or less interference with the movements of the epiglottis.

The affection more often produces symptoms in women, yet frequently exists in men. It is more common in adult life. The symptoms in general are the sensation as of a foreign body; pain usually localized, but sometimes radiating to other parts; fatigue in speaking; the occasional occurrence of cough and spasm, and rarely, dysphagia.

It is a question whether the so-called "globus hystericus," as seen in nervous women, is not generally less a matter of the

imagination than has been supposed, it having been observed that hypertrophy of the lingual tonsil is in such patients commonly present. Normally, on laryngoscopic examination, one sees a free interval between the epiglottis and the base of the tongue. If, however, the latter be studded over with hypertrophied tissue, this free interval will appear filled up. Contact between the tip of the epiglottis and the base of the tongue, without undue antero-posterior folding of the epiglottis or itself, may be taken as an indication of hypertrophy of the lymphoid tissue.

In marked cases, the two sides are unequally affected, and the parts have an œdematous look not unlike the appearance presented by the hypertrophied pharyngeal tonsil.

The treatment should be both local and general. That most highly recommended for local purposes consists mainly in the removal of the hypertrophies by some form of cauterization. In simple cases, marked benefit has been derived from the local application of iodine, an excellent solution of which is Churchill's tincture ʒij to ʒiij each of water and glycerine. In more pronounced cases, actual removal of the enlarged tissue is recommended; for which purpose, the wire snare, applications of chromic acid, and the use of the galvano-cautery are advised. In the hands of the editor, the last named method has proved by far the most satisfactory. Under the influence of cocaine, these operations are usually painless. Constitutional measures, meanwhile, should not be neglected. Indeed, before his attention was called to the surgical treatment of the affection, it has been the custom of the editor, for at least ten years, to administer in such cases associated with indigestion the old-time mixture of rhubarb and soda. In many other cases, even when a specific history was lacking, he has found excellent results follow the administration of small doses of mercury combined with iodide of potassium, and it is his conviction that such means will often render operative interference unnecessary.

TONSILLITIS.

A. Fränkel⁴⁰ calls attention to the possibility of general septic infection originating in the tonsil, while Frœhlich⁴¹ reports an interesting case in which a severe attack of follicular tonsillitis was followed by peritonitis and death. The autopsy showed that the tonsils and the thyroid gland were swollen, and that there was

peritonitis, with fibro-purulent effusion. Frœhlich and his assistant both sustained slight autopsy wounds from which there resulted a severe attack of follicular tonsillitis. The disease was also communicated to a member of the family. In view of the difficulty in differentiating the above disease from diphtheria, it is fair to infer that Frœhlich's cases may have been the latter. Indeed, the question of the infectiousness of follicular tonsillitis is far from being settled, and there are many cases of diphtheria in which a positive diagnosis is next to impossible.

Le Gendre⁴² gives an interesting review of the subject and quotes many excellent authorities. Fox⁴³ thus sums up his conclusions:—

Tonsillitis and its Relations to Scarlatina and Diphtheria.—

(1) There is a commonly occurring form of tonsillitis, symmetrical, varying much in severity, distinct from suppurative quinsy, due to septic causes, often attacking several members of one household, and frequently prevalent at the same time as scarlatina and diphtheria. (2) Short-lived outbreaks of so-called infectious sore throat occur, associated with unsanitary conditions, the cases often varying much from one another, but intermediate in their general characters between tonsillitis and the two specific fevers. (3) The throat lesion is the symptom most constantly present in both scarlatina and diphtheria, but its degree and character greatly vary. It is in some cases apparently identical in nature in the two fevers; and it may be absolutely indistinguishable from the common form of tonsillitis first alluded to. (4) There is some reason for regarding scarlatina and diphtheria as essentially forms of tonsillitis which have acquired the power of infecting the system generally. (5) The virus of these two fevers may probably enter the lymphatic system through the tonsil, producing tonsillitis as a primary effect. (6) The specific character of these diseases is connected with the power of the poison-germ to overcome the resistance of the tissues so far as to reproduce itself in the human body without deterioration; a certain series of lesions is thus set up before the poison is destroyed, and in the mean time its multiplication affords a supply of *contagia* for the communication of the disease. (7) This power of withstanding the resistance of the tissues and reproducing itself within the human body has probably been acquired under a process of evolution. (8) There is nothing in the

occurrence of scarlatina and diphtheria of wounds, and of other mucous surfaces than the fauces, to contravene the hypothesis that the poisons of these diseases in ordinary cases enter at the tonsils. (9) The tonsils are absorbent glands, and their function may not improbably be connected with the absorption of certain elements from the saliva.

Raven⁴⁴ reports an epidemic of exudative tonsillitis in an institution containing eighty children, in which he believed that, although the disease was infectious and showed a distinct membranous deposit, yet the epidemic was not one of diphtheria.

He bases this view upon the sudden onset and high initial temperature; the absence of albuminuria and of glandular swelling at the angle of the jaw; the fact that in no instance did the membrane extend to the larynx; that not a single death occurred, and that no paralytic symptoms ensued. The article is interesting and well worth reading, and although it may not be as clear to others as to the author that the epidemic was distinctly not diphtheria, we must still agree with him that experiences of this kind, if faithfully recorded, may serve to determine the truth with regard to this important question.

Treatment.—Few new suggestions of any value in the treatment of suppurating tonsillitis have been offered. Several authors (Easby,⁴⁵ Green,⁴⁶ Eyling,⁴⁷ Dutton⁴⁸) have again called attention to the value of the salicylate of soda (grains 15 to 20 every three hours) while the use of the bicarbonate of soda (Baker⁴⁹ and Rovira Y. Oliver⁵⁰) applied locally to the tonsil in powder, or in warm solution, seems to have gained fresh adherents. Boeckel has used a 10 per cent. solution of cocaine, applying it to the inflamed tonsil once in fifteen minutes. Pain disappeared after the third application, the anæsthesia lasting about one hour, and the abscess ruptured two days earlier than was expected. He seems to have based his views upon the results of a single case, and to be unacquainted with the dangerous toxic qualities of cocaine. Long,⁵¹ in a case of quinsy, incised an inflamed tonsil, which bled freely, to the patient's relief. Later the nurse reported that the patient was choking. He was found apparently dead, and tracheotomy having been performed, he was resuscitated with great difficulty.

Lebrun,⁵² in view of the infectious nature of acute tonsillitis, uses the following gargle:—

R	Boric acid,	8 grams.
	Eau de Pagliari,	40 "
	Water,	250 "

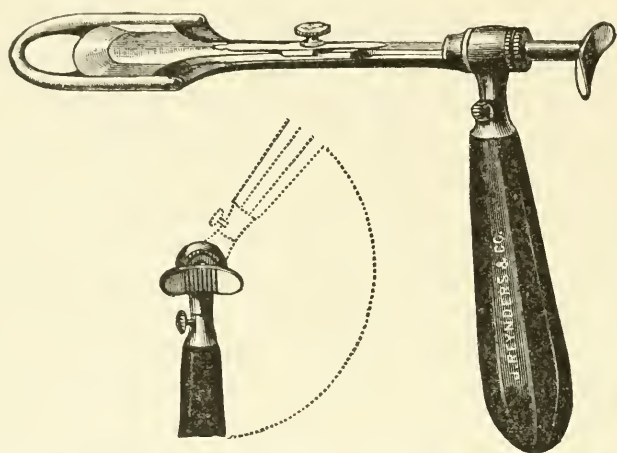
This should be followed by application of iodoform collodion. Doubousquet-Laborde⁵³ believes that the disease is infectious and that, therefore, the usual treatment by means of simple gargles, emollients, heat to the neck and anodynes is useless. Treatment should be general and local. For the local treatment he advises gradual destruction of the tonsil by galvano-puncture, the use of antiseptic gargles and applications. Latterly he administers phenic or salicylic acid, the benzoate of soda or resorcin. He prefers quinine and resorcin because the latter is less disagreeable and much less dangerous.

In an able article by C. H. Knight,⁵⁴ on the galvano-cautery in the treatment of hypertrophied tonsils, the author advises that a fine cautery point, as practiced by Voltolini, be introduced deeply into a crypts of the enlarged gland if the condition be one of simple hypertrophy; or, in the case of a hyperplastic tonsil where the crypts are more or less obliterated, it may be forced directly into the substance of the tonsil. Not more than three independent lacunæ should be cauterized at one sitting. Pain usually is not severe; nor is inflammatory reaction excessive. Local disturbance will have subsided in four or five days, when the eschar may be detached, and the operation repeated. In this way a large tonsil may be destroyed in from five to ten sittings. This method is superior to the less tedious but more rapid one of galvano-caustic écrasement, which, however, in some cases, offers obvious advantages. Knight does not recommend the galvano-caustic method as a universal substitute for excision of the tonsils, which in a large majority of instances is preferable. He believes that galvano-cautery should be reserved for a comparatively small portion of cases, including those in which the hæmorrhagic diathesis is present or suspected, vascular anomalies recognized, anatomical conditions present which prevent a sufficiently complete excision of the organ or the use of the knife declined. He is strongly disposed to add that this method should be chosen for all adult patients. As if to corroborate this latter opinion, the literature of the year is unusually rich in reports of cases of hæmorrhage following tonsillotomy.

Dr. F. Massei, of Milan, Italy, Corresponding Editor of the *ANNUAL*, writes that two hours after an operation of this kind the patient began to spit blood. A vessel on the cut surface was seen, seized and twisted with the hæmostatic forceps. The patient then vomited about three hand-basinfuls of blood, which he had been swallowing for two hours as it flowed from the cut artery. Another accident occurred to a young woman on whom bilateral tonsillotomy was performed. Ten days after, a blackish projection from the right tonsil was noticed. Tonsillotomy was again performed and a large piece of necrosed tissue removed. In a few days the wound had healed. This last case is difficult to explain.

Clinton Wagner⁵⁵ reports a case in which abundant bleeding occurred from the wounding of an artery of considerable size situated at the inferior part of the tonsil, and near the base of the tongue. Styptics and direct pressure having failed, torsion of the artery was successfully applied. Downie⁵⁶ publishes in detail a case of extraordinary interest. Severe hæmorrhage, after excision of both tonsils, in a strumous subject, by which the patient was greatly prostrated, was followed one year later by hæmoptysis and death within a month, from hæmorrhagic phthisis. He calls attention to the possibility of the sudden withdrawal of a large quantity of blood acting as a predisposing cause of phthisis. Sands⁵⁷ saw in consultation a man of twenty from whom both tonsils had been excised with the tonsil guillotine. Hæmorrhage following the operation was slight, and soon checked. In the evening, however, it returned from the right side of the pharynx, and continued until, by morning, the patient was almost exsanguinated. The right common carotid was tied, but the bleeding continued. Dr. Sands performed transfusion, and injected a pint of a saline solution. During the operation the strength and volume of the pulse improved. The patient ultimately recovered. The theory that the patient was a bleeder was disproved from the fact that there was no hæmorrhage from the left side or from the wound made in tying the carotid. Sands believed that it was probably due to the division of a large tonsillar artery. In a discussion of Dr. Sands' paper, Dr. Briddon says that in a man whose inflamed tonsil had been excised three days before, he found the patient much prostrated from hæmorrhage. On examination, a small stream of blood was seen spouting from the incision. It was checked by applications

of per-sulphate of iron. Hall⁵⁸ reports an interesting case, in which a man of 26, suffering from quinsy, was suddenly seized with a hæmorrhage so copious that within a few moments he died. He believed that in the process of ulceration the wall of the internal carotid had been weakened, and that the bleeding came from an aneurismal dilatation at that point. Somewhat similar is the case of Poshensky,⁵⁹ in which in an intense phlegmon of the tonsil, extending to the velum and surrounding parts, spontaneous opening attended with copious hæmorrhage occurred. Although a tampon was applied, the bleeding recurred, and was only stopped by ligation of the common carotid, ligation of the external carotid alone not being deemed sufficient.



MANDEVILLE'S MODIFICATION OF PHYSICK'S TONSILLOTOME.—(*New York Med. Journal.*)

Zuckerkindl⁶⁰ has found that it is impossible to wound the internal carotid in the operation of tonsillotomy, as apart from the wall of the pharynx, and the fat which occupies the region behind the tonsil, there is in addition a muscular layer which lies in front of the carotid artery. There is also little risk in scarifying the tonsil, or in opening an abscess in it. On the other hand, an injury would be quite possible in opening a retro-pharyngeal abscess.

Three modifications of the tonsillotome have been devised: one by Mandeville⁶¹ is a modification of the Physick tonsillotome, by which the instrument can be changed from left to right, and vice versa, without unscrewing the handle. The handle is attached to the instrument so it will revolve around it, a spring bolt stopping

it at the desired point. This bolt is controlled by the thumb of operator drawing a slide which is placed in the shank of handle.

Schulte's⁶² instrument is a complicated modification of the Fahnestack tonsillotome, while that of Fritsche⁶³ is specially designed for use in children.

CHANCRE OF THE TONSIL.

Boeck⁶⁵ reports three cases, and within ten years has seen nine. They have generally been in those in the habit of using the same utensils for eating and drinking, which had been employed by others suffering from syphilis. An early diagnostic sign is enlargement of the glands at the angle of the jaw. Graarud⁶⁶ also reports three cases all in the same family, the infection having come from the use of the same cups and pipes. Rabitsch⁶⁷ reports one case.

CANCER OF THE TONSIL.

Croly⁶⁸ reports two cases of primary sarcoma of the tonsil, one in a boy of seventeen, the other in a man of over fifty. In both the disease was at first mistaken for quinsy, and incisions made to evacuate the supposed abscess. In the first case the disease—round-cell sarcoma—quickly recurred after extirpation of the gland. In the second case the patient died from exhaustion caused by repeated hæmorrhages.

REFERENCES.

1. Jour. Am. Med. Assoc. 2. Brit. Med. Jour. 3. La Semaine Méd., abstract in Lancet. 4. Brit. Med. Jour. 5. Jour. des Sci. Méd. de Lille. 6. Jour. of Laryngology. 7. Med. News. 8. Practitioner. 9. N. Y. Med. Jour. 10. Med. Register. 11. Cent. f. Laryng. 12. Med. Register. 13. Chicago Med. Times. 14. Jour. Am. Med. Assoc. 15. Jour. of Laryng. 16. Brit. Med. Jour. 17. An. des Mal. du Larynx, etc. 18. Inter. Cent. f. Laryng. 19. Brit. Med. Jour. 20. La Semaine Méd. 21. N. Y. Med. Jour. 22. Inter. Cent. f. Laryng. 23. Inter. Cent. f. Laryng. 24. Southern Med. Rec. 25. Med. Chronicle. 26. Berlin. klin. Woch., 1886. 27. Jour. de Méd. de Bordeaux. 28. Revue Mens. de Laryng. 29. Jour. of Laryng. 30. Phila. Med. Times. 31. An. des Mal. du Larynx, etc. 32. Deut. Arch. f. klin. Med. 33. Brit. Med. Jour. 34. N. Y. Med. Jour. 35. Brit. Med. Jour. 36. Trans. N. Y. Acad. Med. 37. Berlin klin. Woch. 38. Southern Cal. Pract. 39. Jour. Am. Med. Assoc. 40. Dent. Med. Zeit. 41. N. Y. Med. Jour. 42. Rev. Mens. de Laryng. 43. Jour. of Laryng. 44. Practitioner. 45. Brit. Med. Jour. 46. Brit. Med. Jour. 47. Brit. Med. Jour. 48. Brit. Med. Jour. 49. Brit. Med. Jour. 50. Jour. of Laryng. 51. Med. and Surg. Rep. 52. La Clinique. 53. Gaz. des Hôpitaux. 54. N. Y. Med. Jour. 55. N. Y. Med. Jour. 56. Edinburgh Med. Jour. 57. N. Y. Med. Jour. 58. Boston M. and S. Jour. 59. Gaz. Med. di Roma. 60. Wien. Med. Jahrb. 61. N. Y. Med. Jour. 62. Illus. Monats. f. Aerzl. Polytech. 63. Deut. Med. Woch. 64. Rev. Mens. de Laryng. 65. Rev. Mens. de Laryng. 66. Rev. Mens. de Laryng. 67. Berlin klin. Woch. 68. Brit. Med. Jour. 69. Glasgow Med. Journal.

[Undated references apply to journals published in 1887, and original articles can be found by consulting the indexes of the respective publications.]

DISEASES OF THE LARYNX TRACHEA AND ŒSOPHAGUS.

By J. SOLIS COHEN, M.D.,

PHILADELPHIA.

DISEASES OF THE LARYNX.

ANATOMY AND PHYSIOLOGY.

Physiological Rôle of the Arytenoid Muscle.—Dr. Moura, of Paris, has been studying the physiological rôle of this muscle, principally the direction of its fibres, from the course of which, as well as from the distribution of its nerve-supply, he finds that it is innervated by the same twig which innervates the posterior crico-arytenoid muscle. He concludes that this muscle is, like the latter, an abductor of the glottis, and not an adductor, as generally believed. Dr. Moura supported his view by rotating the external borders of the two cartilages backward, and demonstrated this action in his own person, under inspection in the laryngoscopic mirror. The escape of air is not necessary to produce a separation of the sides of the cartilaginous portion of the glottis. This can be accomplished solely by the action of the arytenoid muscle. The separation is accompanied by a valvular noise. During the entire experiment, his respiration was voluntarily suspended, and the flame of a lighted bougie held in front of the mouth remained unaffected. We are not aware that any one, as yet, has been able to repeat his experiments, and do not know that his views have received any support from other observers. They reverse completely the opinions entertained by all authors who have written upon the mechanism of the normal larynx in respiration and phonation.

Structure and Function of the Thyro-Arytenoid Muscle.—Alexander Jacobson² was led by the peculiarities of a case in his practice to study the topographical distribution of the isolated fasciculi of this muscle. He has found it much more complicated than has usually been described. Some of its fibres are so arranged as to assist abduction by their contraction, so that the opening of the glottis cannot be accomplished exclusively by the posterior

crico-arytenoid. He considers these fasciculi an important element in the production of changes in pitch, comparing the effect to that produced in playing the fiddle by moving and passing the finger on the string. It is suggested that these fasciculi would be found only in the well-developed larynges of singers. More than twenty years ago Bataille described the minute anatomy of this muscle.

The Lymphatic Vessels of the Larynx.—Having frequently encountered one or two lymphatic ganglions in front of the crico-thyroid membrane (Fig. 1), P. Poirier³ inquired as to their afferent lymphatics. On dissecting cautiously under a lens, he could see that they received posteriorly several trunks which left the larynx through perforations in the crico-thyroid membrane, and it was presumed that they were derived from the subglottic portion of the larynx. Then injecting the inferior portion of the mucous membrane of the larynx with mercury, he found that the entire mucous membrane of the subglottic portion of the larynx, including the internal face of the vocal bands, immediately became covered with

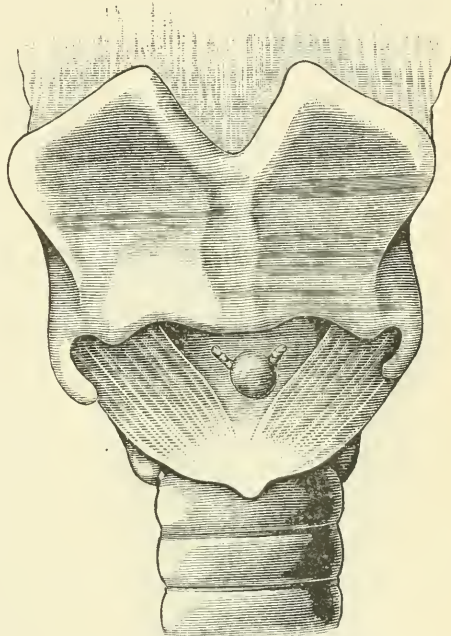


FIG. 1.—LYMPHATIC GANGLION OVER THE CRICO-THYROID MEMBRANE.—(*Bulletin de la Soc. Anatomique.*)

a magnificent net-work. (See Fig 2.) He also found that several injected trunks traversed the crico-thyroid membrane, and entered the prelaryngeal ganglion above spoken of. Poirier found the ganglion 49 times in 100 cadavers. He thinks it atrophies and disappears in the aged. It has the size of a pea in the adult; and is sometimes very small and difficult to detect in the infant. It is usually in the median line, but sometimes is concealed beneath the internal border of one or the other crico-thyroid muscles. Two ganglions are found instead of one in about one instance out of six.

Anatomy and Physiology of the Recurrent Laryngeal Nerve.—

The activity shown in America and abroad in studying the functions of the laryngeal nerves gives great hope of important results in the near future. Especially elaborate papers from different standpoints were contributed to the transactions of the ninth annual meeting of the American Laryngological Association. Dr. F. H. Hooper,⁴ of Boston, has added to his earlier papers an interesting study which presents an accurate summary of the subject up to the date of his own communication. Dr. Hooper summarizes the results of his experiment as follow:—(1) The

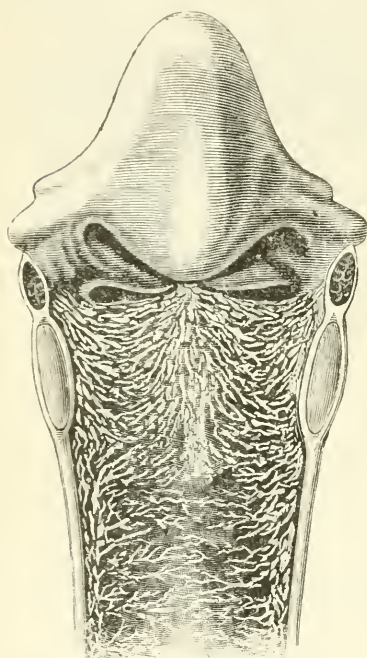


FIG. 2.—LYMPHATIC NET-WORK OF THE LARYNX.—(*Bull. de la Soc. Anatomique.*)

recurrent laryngeal nerves are purely motor in their function. (2) Their action upon the glottis differs in different animals. (3) In the dog their normal action is to close, while in the cat they open the glottis. (4) In the dog, sulphuric ether and huge doses of morphine reverse the normal action of the recurrent nerves; the glottis, under the influence of these drugs, dilates instead of closing on stimulation of the recurrents. (5) The “ether-effect” varies according to the susceptibility of the dog, to the amount of the drug consumed, and to the intensity of the irritation. (6) Under small doses of ether, stimulation produces in dogs two effects upon the glottis: (a) vibration; (b) closure. Under large

doses, according to the intensity of the irritation, four effects may be observed: (a) vibration; (b) complete dilatation; (c) mixed movement; (d) closure. (7) Under very large doses of ether, closure, in certain dogs, can not be obtained with any intensity. (8) Under small doses of chloral, chloroform and morphine, stimulation of the recurrent nerves of dogs is followed by the same results as under small doses of ether, namely, (a) vibration; (b) closure. (9) The mixed movement is occasionally seen in

dogs when narcotics other than ether are given in large doses. (10) In the cat, death reverses the normal action of the recurrent nerves. In from five to twenty minutes after death, stimulation causes a contraction of the glottis, while in the living cat dilatation is produced.

Dr. F. Donaldson, Jr.,⁴ of Baltimore, writes upon the same subject. His views differ materially in some respects from those of Dr. Hooper, and are largely controversial. Analyzing his experiments, Dr. Donaldson finds (1) that an abduction of the vocal bands can be obtained with electrical stimulus, without etherization; (2) that abduction follows weaker, and adduction, stronger stimuli; (3) that there is no variation in the result.

TUBERCULOSIS OF THE LARYNX.

Dr. Clarence C. Rice,⁵ of New York, contends that laryngeal phthisis is not always laryngeal tuberculosis; but that in about 35 cases out of 100 the process is slow and insidious, commencing with an ordinary subacute catarrh, which becomes chronic, and finally ulcerative, when the general health of the patient has become much impaired.

At the meeting of the British Medical Association in Dublin in August, a discussion on phthisis of the larynx was introduced by Dr. Prosser James, Dr. Hunter Mackenzie and Mr. Lennox Browne; Dr. Woakes, Mr. Stoker, Dr. F. H. Hooper (Boston, U. S. A.), Drs. Warden, Hayes and Whistler taking part in the discussion. There was a general agreement that phthisis of the larynx may occur prior to any manifestation in the lungs.⁶

Dr. W. H. B. Aikins⁷ exhibited a larynx of which the vocal bands and arytenoid cartilages were covered with tuberculous ulcers in which the microscope revealed the bacilli tuberculosis in abundance. The interesting point in connection with this case is that no tuberculous deposits were found in the lungs.

Treatment.—Dr. Theodore Hering,⁸ of Warsaw, while ardently advocating the topical use of lactic acid in laryngeal tuberculosis, disclaims all idea of regarding it as a panacea for tuberculous ulceration or as applicable to every instance. He finds that it neither prevents recurrence nor extension of the process upon adjacent tissues, and that the cicatrizations it produces cannot be regarded as definitive so long as infiltrations exist, and especially

so long as the constitutional condition has not undergone that improvement which may be regarded as protective against fresh infiltration with tubercle. However, no other treatment has given him such excellent results.

Hering's method of using lactic acid varies from that of Krause in the following points: He uses cocaine (15–20 per cent.) not only before the application, but also after the application when the pain is severe, and tries to further diminish the pain with gargles of ice water and with cold compresses. In severe cases he injects cocaine under the mucous membrane 0.015 to 0.03 in $\frac{1}{2}$ per cent. solution of carbolic acid, which produces extensive anæsthesia in from five to seven minutes. While the anæsthesia is not so intense as with energetic pencilings, it is frequently much more prolonged, continuing sometimes for hours to fully control the dysphagia. When the infiltrations do not yield to the ordinary method, he makes deep multiple incisions and commences the next day with frictions with lactic acid. When, in spite of this procedure, the ulceration shows no tendency to cicatrize, he resorts to the curette, and energetically scrapes the hypertrophic edges in their floors. The ulcers then heal much more rapidly than under lactic acid alone.

Hering's results have been confirmed by the experience of several other observers, notably Gouguenheim,⁹ of Paris, who, in 13 cases of tuberculosis of the lungs and larynx, secured definitive cures in from three to twelve months. In 9 other cases recurrence took place after the original cicatrization, and even recicatrization took place in 3 of the 9. The method is also highly advocated by Dr. George W. Major, of Montreal, who finds it especially efficacious in the early stage of œdema and club-shaped swelling of the arytenoid bodies. Dr. von Brunn,⁸ of Lippspringe, finds lactic acid preferable in strong and torpid subjects, and menthol preferable in delicate and nervous ones. He places great confidence in Moritz Schmidt's recommendation of tracheotomy before there is any great stenosis calling for it mechanically. He finds that relief from the compressed stream of air and the thermic and mechanic irritation of the larynx favors cure of the laryngeal ulcerations, and lessens the danger of inspiration of bacillary secretions into the air passages.

Dr. M. A. Rosenberg,¹⁰ of Berlin, reported to the Berlin

Society of Medicine that in 80 cases he had used a solution of menthol in olive oil, 5 per cent. to 20 per cent., applied directly to the ulcerations with excellent results, the pains and the dysphagia subsiding, nutrition improving, and the ulcerations undergoing granulation and becoming healed in from two to eight or ten weeks. Some of the patients had maintained their improvement for more than a year. Menthol acts more slowly than lactic acid, but does not produce so much pain. Its beneficial action is explained by its combined sedative and antiseptic properties. This menthol treatment has been endorsed by many physicians, among whom may be mentioned Mr. Lennox Browne, of London, and Dr. James G. Hyndman, of Cincinnati. The topical use of iodol in preference to iodoform is advocated by Lublinski,⁸ applied directly by insufflation, once daily or two or three times a week. Two cases resulted in complete cure of the laryngeal tuberculosis, the pulmonary condition remaining unchanged. In his two other cases, marked improvement of the laryngeal ulcers ensued. Healthy granulation took place, the dysphagia diminished and the general condition improved.

Dr. M. L. Bergeon,⁹ of Lyon, presented a patient in whom he had obtained a complete cure of laryngeal ulcerations by means of gaseous enemata of sulphuretted hydrogen, the cure having been maintained for seven months. In a discussion upon the subject reported to us by Dr. de Havilland Hall, of London, Dr. Hunter Mackenzie¹² directed attention to the operation of tracheotomy, or of laryngo-tracheotomy, not as a mere palliative but as an efficient curative agent. This proposal was not accepted by all the speakers. The extirpation of a tuberculous larynx was condemned. In fact, there seemed to be a pretty general concurrence in discountenancing any very violent surgical treatment and trusting rather to remedies of a sedative or mildly astringent nature. The question of the propriety of tracheotomy as a remedial measure receives additional support from its strong advocate, Dr. Moritz Schmidt,⁸ of Frankfort on the Main, who reports 7 additional cases, 3 of whom are living examples of cicatrized tuberculous ulcerations. 1 was tracheotomized in January, 1885, 1 in October, 1886, and 1 in January, 1887. Of 15 tracheotomized during two years, cicatrization took place in 5, and 1 was very much benefited.

Tuberculosis and Syphilis.—Tuberculosis is very frequently associated with syphilis, and there is nothing to prevent a syphilitic subject from becoming tuberculous. Nevertheless the simultaneous association of ulcerations from the two conditions are rare. In this connection an interesting instance of associated syphilitic and tuberculous ulceration of the throat is reported by Dr. J. D. Arnold,¹³ of San Francisco, the patient perishing eventually by uncontrollable diarrhœa, probably tuberculous enteritis. Ulcerations in the vocal bands and in the epiglottis underwent cicatrization under mercurial treatment (hydrg. protiodide), but concomitant arytenoid swellings and deep interarytenoid ulceration did not undergo the slightest repair. Schnitzler,¹⁴ of Vienna, contributes an illustrative instance of combination of syphilis and tuberculosis of the larynx. He maintains that the syphilitic ulcer forms a very good nidus for the development of the bacilli of tubercle. A case is mentioned in which, at the autopsy, Rokitsansky was unable to determine whether the case had been tuberculosis or syphilis, or a combination of both.

SYPHILIS OF THE LARYNX.

Dr. Edgar Holden,⁴ of Newark, N. J., reports an interesting case of gummatous disease of the larynx with spontaneous reopening of the larynx after thyroid laryngotomy.

A debilitated man, 35 years of age, with dyspnœa, aphonia, dysphagia and nausea, had almost complete occlusion of the larynx, with cicatrices on the epiglottis and right laryngeal wall, but no active ulceration. (Fig. 3.) After ten days marked improvement under potassium iodide, sudden intolerance of the remedy occurred with such retrogradation that thyroid laryngotomy was performed.

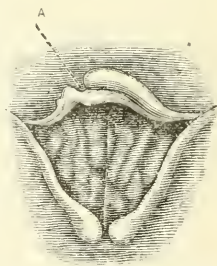


FIG. 3.—A. CICATRIZED LESION OF THE EPIGLOTTIS.

The open larynx as shown in Fig. 4 exhibited the vocal bands intact, but hyperæmic and apparently hypertrophied. Some rugæ on the right wall, which had been noted laryngoscopically, were yellowish-pink in color, suggestive of fatty degeneration, not detachable nor movable on the cartilage and but slightly vascular. Precautionary tracheotomy was performed above the thyroid isthmus. The tube was removed on the tenth day, respiration being perfectly free and phonation

very fair. At his home, an insalubrious spot, the whole wound was torn open forty days after the operation, during a paroxysm of cough induced by lodgment of food in the glottis. Catarrhal laryngo-tracheitis ensued and he died of exhaustion six months and fourteen days after operation, having lived five months with an open larynx. No autopsy was permitted.

In an interesting paper on syphilis of the larynx, Dr. C. Lewis¹⁵ describes a case of a child aged eight years, the victim of acquired syphilis, in whom the right vocal cord was paralyzed. Little or no movement could be observed in abduction; the left cord seemed partially so. Antisyphilitic remedies and local stimulation were employed. The voice gradually regained its normal tone, and after seven weeks' treatment had completely recovered. Dr. Lewis regarded this as due to some syphilitic lesion in the brain attacking the nucleus of the spinal accessory nerve in the medulla.

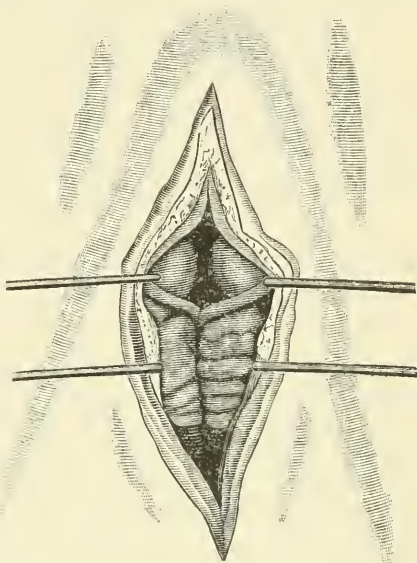


FIG. 4.—GUMMATOUS LARYNX EXPOSED BY THYROID LARYNGOTOMY.—(N. Y. Med. Jour.)

Dr. Barclay Bacon records a case of tertiary syphilis in which almost all the epiglottis was destroyed by ulceration. The patient was killed by swallowing a piece of bread and butter and washing it down into his larynx with tea, death being caused by suffocation. This is an exceptional accident, as one is often astonished at the way patients are able to swallow without food entering the larynx, even after complete destruction of the epiglottis.

LARYNGITIS.

Simple Laryngitis.—Dr. Descroizelles³⁰ describes in detail a form of simple laryngitis in infants, difficult of diagnosis. It is apt to be confounded with stridulous laryngitis and with diphtheritic laryngitis. There may be hoarseness, and paroxysms of suffocation, separated by intervals of complete apyrexia,

but which may be sufficiently intense to excite considerable anxiety.

Submucous Laryngitis.—In a severe case in a girl 18 years of age, and in which tracheotomy seemed urgently indicated, Dr. A. H. Buckmaster,⁴ of New York, injected hot water at about 120° F. against the parts with a Davidson's syringe, and saved the patient.

Acute Œdematous Laryngitis.—Dr. Barclay Baron⁶ reports a case of extremely acute Œdematous laryngitis. Only about three hours elapsed between the first feeling of pain and a condition of grave dyspnoea and lividity. The epiglottis was seen to be extremely Œdematous, being turgid, erect and glistening, almost touching the back of the tongue, and its sides so nearly came into contact that a space capable of admitting a small catheter, was all that was left open. The treatment consisted in hot poultices to the larynx, a moist atmosphere impregnated with the compound tincture of benzoin, and food by enemata. The patient made a slow but sure recovery. The points of interest in the case are the very sudden onset; the absence of any cause except slight pharyngeal congestion due to a cold in the head; the recovery from great Œdema of the larynx without scarification; and lastly, the good effect of feeding by enemata.

Contrary to what might have been expected, Œdema of the larynx as a direct result of Bright's disease, is extremely rare.¹² Morell Mackenzie investigated 200 cases of Bright's disease in the London Hospital, and did not find a single case of Œdema of the larynx; and George Johnson,⁴⁰ who has had an unusually large experience in Bright's disease, does not remember ever to have seen a case complicated with Œdema of the larynx as a direct result. This being so, every case met with is worthy of being recorded, and it is to be regretted that the particulars of a case reported to the Academy of Medicine in Ireland were not given more in detail. The following sentence is all that occurs: "Dr. Christopher Nixon exhibited the larynx and trachea of a patient who had died under his care of what it is the custom to call Œdema glottidis, occurring in the course of Bright's disease."

Phlegmonous Laryngitis.—Dr. Urunuela¹ reports a case of acute phlegmonous and suppurative laryngitis cured chiefly by topical applications of solutions of carbonic acid and iodoformized glycerine, and emollient inhalations of belladonna.

Hemorrhagic Laryngitis.—A case of hemorrhagic laryngitis has been reported by Garel.¹ In this case the formation of the clots observed laryngoscopically, and of which an illustration is given, was preceded by a laryngitis of rheumatic character which lasted for a month without presenting any other signs than those of ordinary catarrhal laryngitis. Hence he believes his case to be entitled to be called one of hemorrhagic laryngitis.

Dr. C. E. Bean⁴, of St. Paul, reports a case under his care for several years, recurring suddenly after violent cough excited by inspiration of irritant substances, apparently overcome, finally, under the administration of extract of ergot, half a grain three times a day.

Blennorrhœa of the Larynx.—Dr. Krakauer⁸ exhibited a patient with Stoerk's blennorrhœa. She was 36 years old and had never been sick. There was no evidence of tuberculosis or syphilis. Repeated temporary attacks of hoarseness had occurred of late years. An attack three weeks before gradually led to the following condition: grayish-brown crusts beneath the vocal bands parallel to their free borders and somewhat projecting beyond them, especially extending toward the anterior commissure and preventing proper glottic closure. The calibre of the larynx was much encroached upon, and there was marked dyspnoea and fetidity of breath. The nasal membrane was nearly normal, save a slight atrophy without any crusts or abnormal secretions. The naso-pharyngeal space was in a similar condition. The epiglottis and ary-epiglottic folds were somewhat reddened. The prognosis was considered grave on account of the liability of the edges of the mucous membrane to excoriation from the crusts and consequent disposition to adhesions.

Stridulous Laryngitis with General Emphysema.—An instance of general emphysema consecutive to a stridulous laryngitis has been reported by Dr. Cadet de Gassicourt.⁴¹ The patient was a girl 5 years of age, who was attacked with suffocative paroxysms the night following a slight attack of laryngitis. Similar paroxysms occurred the next day with great dyspnoea, and tracheotomy was in contemplation. The contingency, however, did not arrive, but the next day a remarkable cutaneous emphysema extended from the base of the neck as far as the superior two-thirds of the anterior surface of the thorax. It did not extend farther, but attained its

maximum in a few hours, remained stationary for ten days, and then gradually subsided, disappearing definitively only at the end of the thirteenth day.

Chronic Laryngitis.—Dr. Hunter Mackenzie,⁴ of Edinburgh, in an article on chronic laryngitis and its sequelæ calls attention to the fact that a neglected chronic laryngitis may drift into tuberculous laryngitis or into distinct tumor formation. The presence of elastic tissue in the sputum he regards as misleading as an indication of tuberculous disease of either the larynx or the lungs. He contends that tubercle, first of the larynx and then of the lungs, may be the sequel of chronic laryngitis, and cites a confirmatory instance. He calls attention to the fact that chronic laryngitis in specific lesions like carcinoma may render fallacious the results of microscopical examinations of fragments detached spontaneously or removed by operative procedure.

Chronic Hypertrophy of the Ventricular Bands.—A series of 82 cases in his own practice are tabulated and commented on by Dr. Bernard Tauber,¹¹ of Cincinnati, all due to inflammatory thickening and inflammation, the large majority in individuals using the voice in their professional avocations.

Affections of the Crico-arytenoid Articulation.—Dr. Major,²⁴ of Montreal, discusses the subject of sprain, dislocation, direct local injury, inflammation, and ankylosis of the crico-arytenoid joint, and details examples of some of these conditions from his own practice. Dr. Louis Jurist,²⁴ of Philadelphia, reports a case of perichondritis of the cricoid cartilage in which death took place suddenly by suffocation, immediate laryngotomy and artificial respiration failing to revivify the subject.

Idiopathic Intralaryngeal Abscess.—G. Macdonald¹⁹ reports two cases in which the pus was released by intralaryngeal puncture with prompt recovery.

The editor²⁴ believes that intralaryngeal abscess from diseased cartilage is best treated by splitting the larynx in the middle line, removing the dead structures, and thoroughly scraping the parts down to healthy tissue. This being accomplished, measures should be immediately taken to provide for drainage in case of continuation of the suppurative process and to adopt such aseptic management of the parts as the conditions found may indicate. Thorough response to these indications may require precautionary tracheotomy

for respiratory purposes until subsidence of the diseased process has taken place, or for the purpose of securing functional rest to larynx when such subsidence is not going to take place.

This plan is far more judicious than to await the fragmentary discharge of carious particles, or carious cartilages by expectoration, or attempts at their withdrawal by intralaryngeal procedures through the normal apertures. When the larynx is exposed by section to direct vision, the entire extent of the disease can be determined, and fatally diseased tissues be removed at once. The impairment of voice which may follow must be regarded as a secondary matter in the great majority of instances. Prompt treatment of this kind ought to save many cases that perish because proper surgical interference is postponed so long that the hurried tracheotomy performed in an emergency merely saves the patient from impending suffocation, while he dies a few days later from septic poisoning, the result of absorption of pus which should have been evacuated by the most direct access possible, whether by intralaryngeal puncture or incision, or by cutting down upon the parts from the exterior.

FOREIGN BODIES IN THE AIR PASSAGES.

Boyce,¹⁹ of Edinburgh, reports an instance in which the foreign body, the greater part of the vulcanite mouthpiece of a pipe, was expelled, after some seven week's sojourn, in a violent fit of coughing, excited by swallowing a small fishbone. The symptoms of the presence of the foreign body had been so slight as to raise no suspicion of its presence in the passages. Dr. S. W. Langmaid,⁴ of Boston, reports the successful removal of a pin from the larynx two years after it had been swallowed. It protruded from an ulcerated point in the left ventricular band. Two years before Dr. Langmaid had been unable to find any rational signs of the pin, which the patient had swallowed some three months previously. Our Corresponding Editor, Dr. Major, of Montreal, reports the removal of a nutshell impacted in the larynx, which was dislodged with the assistance of a probe. Dr. J. F. Thompson,²⁰ of Washington, had occasion to perform tracheotomy to remove a cockle bur impacted in the larynx of a lad of 16. Failing to detect and grasp the body with the tracheal forceps, he inserted an index finger into the larynx, and with

this additional aid was able to dislodge the body, push it up and extract it through the mouth. Dr. Sajous verbally reports the case of a boy, aged 14, who had inhaled a cockle bur while running. The bur, lodged below the vocal cords, beneath the anterior commissure, was dislodged after anaesthesia of the larynx with cocaine. The one effort with laryngeal forceps sufficed. Dr. Godet²¹ reports a case of leech in the subglottic portion of the larynx, removed through thyroidotomy. David Newman,¹⁵ of Glasgow, relates a case in which he removed, with Schrötter's forceps, a splinter of a rifle ball from the left ventricle. The patient, a marker at a rifle range, had been wounded with a splinter on the right side of the larynx at a point corresponding with the crico-thyroid membrane.

PROLAPSUS OF THE VENTRICLE.

Dr. George W. Major,⁴ of Montreal, reports five cases of prolapsus of the ventricle, two of which were mere examples of eversion. Jelenffy,²² in reviewing this subject, recommends a special method of treatment which has been successful in his hands in two instances. Starting with the proposition that by preventing the nutrition of the prolapsed mucous membrane, it must necessarily perish, he made, daily, a couple of small incisions through the ventricular bands, from before backwards. On the third day the parts first incised had begun to disappear, and in about ten days the whole tumor itself, except a small portion which he subsequently removed with forceps, had disappeared.

MOGIPHONIA.

Under this head, Prof. B. Fränkel, of Berlin, describes a neurosis of the voice in professionals, in which there is great difficulty in using the voice, analogous to that of moving the fingers in cases of writer's cramp. Fränkel treated his cases by forbidding the peculiar use of the voice which had been injurious in each instance, *i.e.*, preaching, singing, teaching, and in one employed massage over the larynx, forty or fifty strokes daily on each side from above downward. The cases improved within a few days, and were cured in six weeks. Dr. M. Bresgen,⁸ of Frankfort, has seen the same class of cases, but usually associated with intranasal disorders. He considers them due to the

mechanical effect of the occlusion of the nasal passages, and not to any reflex influence. He obtained excellent results by treating the nasal disease without any topical medication to the larynx whatever. He therefore directs attention to the importance of examining the nose as well as the larynx in cases of this kind.

PHONATORY DISTENSION OF THE LARYNGEAL SACS.

The editor²⁴ notes an unique instance of phonatory distension of the laryngeal sacs into the interior of the larynx in a man who had been under his treatment for stenosis following thyrotomy for the removal of morbid growths.

SPASM OF THE GLOTTIS.

Dr. Maximilian Bresgen¹⁷ reports a case of spasm of the glottis, produced by aneurism of the aorta, in a man, aged 46.

When examined laryngoscopically, in a condition of quiet, no special abnormality was observed. When the symptoms were present, both vocal bands were seen in the middle line with but a narrow slit between them, while they were but slightly movable. Subsequently, in a state of quietude, the normal condition was again observed. On the evening of the same day, as the patient left his work for his home, he fell dead suddenly, with a small flow of blood from the mouth. At the autopsy an enormously dilated atheromatous arch of the aorta was seen, with an aneurism the size of a small apple, which had broken through a small circular perforation in the anterior wall in the trachea, just above the left bronchus. The autopsy had been so badly conducted that it was impossible to detect the relations of the aneurism to the pneumogastric nerve and to the recurrent laryngeal.

That improper nourishment is an active factor in the etiology of spasm of the glottis in children seems to be well sustained in an article by Dr. Flesch,¹⁷ of Frankfort, and inspired by a statement by Jürgensen that in his more than twenty years' practice he had not seen a disorder in children which he could designate as *spasmus glottidis*. Dr. Flesch expresses the opinion that the better nourishment of children with mothers' or nurses' milk has been the cause of immunity in the practice referred to. In his own practice he has seen more or less of the disease every

year, and he believes that it is, more than any other disease, dependent upon bad diet and poor hygiene. The weekly reports of deaths in Frankfort include from one to four from spasm of the glottis; but this does not express the full number of patients, inasmuch as death is an infrequent result. On the other hand, many cases designated as eclampsia are nothing else than sequelæ to laryngismus.

Treatment.—The value of prophylactic tracheotomy is shown in a case reported by Dr. Gläser,²² of Hamburg. A rachitic but tolerably well nourished child, one year of age, was supposed to have whooping-cough. During the first six months of life it had had frequent attacks of spasm of the glottis, not infrequently terminating in general convulsions. After a severe paroxysm prophylactic tracheotomy was performed. Paroxysms continued to appear, but were no longer menacing to life. On the eleventh day the outer opening of the canula was plugged, and three days later, no paroxysms having intervened, the canula was withdrawn, the wound closing spontaneously in five days. No further attack of spasm of the glottis occurred, and the child recovered with unusual rapidity.

NEUROSES.

Paralysis of the Abductors.—Dr. Dujardin,¹⁸ of Havre, reports a case of compression of the recurrent nerves by an organic stricture of the œsophagus. The right vocal band was much congested and fixed in the phonatory position. The left band moved freely at first, but later, though remaining mobile, separated from its fellow with a sort of hesitation, so to speak. Whether this latter condition was of reflex origin, or due to direct implication by extension of the tumor, or to compression by diseased glands, remains obscure, as no autopsy was allowed to be made.

Dr. Luc²⁵ reports an instance in which paresis of the dilators of the glottis enabled him to recognize the commencement of tabes dorsalis. A man 35 years of age had sibilant respiration on prolonged exertion and during sleep. The symptoms had presented gradually during several months, and, though sometimes breathing was greatly embarrassed, there had been no actual paroxysms of suffocation. The vocal bands were very moderately separated during respiration, and became approximated almost to contact on inspiration; but an appreciable interval was retained between

the arytenoid cartilages. It might be interesting to collate the latter point with the views of Moura as to the dilator function of the arytenoid muscle. Dr. A. Weil,¹⁸ of Heidelberg, reports a similar case in which a man, who had had syphilis three years before, presented a paralysis of the dilating muscles of the glottis as the initial symptom of tabes dorsalis. Dr. G. Gerhardt describes two cases of paralysis of the vocal bands associated with icterus. Both patients left the hospital with their vocal bands again in good condition.

The subject of bilateral paralysis of the abductors is well discussed by Dr. Percy Kidd,¹⁹ of Brompton, who, in addition, reports a case of bilateral paralysis of the dilator muscles of the glottis, with subsequent paresis of the constrictors, which occurred under his own observation. A carpenter, 47 years of age, had had dysphagia and dyspnoea for twelve months, during the last five or six of which he had been losing flesh. Hoarseness had developed during the last three months, and the dysphagia and dyspnoea had greatly increased. The vocal bands approximated properly during phonation, but did not diverge more than $\frac{1}{16}$ of an inch on inspiration, and on deep inspiration they almost met in the middle line. There was no appearance of tension; in fact, the vocal bands seemed more lax than usual. Subsequently paresis of the constrictors intervened, the vocal bands approaching in a faltering manner in attempts at phonation, and then receding to a position midway between that of phonation and of quiet inspiration. The lesion was attributed to new growth of the cervical and mediastinal glands, secondary to malignant disease of the œsophagus, implicating the recurrent laryngeal nerves.

In a lecture on some points in relation to the diagnostic significance and therapeutic indications of laryngeal symptoms resulting from pressure of aneurisms upon the vagus and the recurrent laryngeal nerves, Dr. David Newman,⁶ of Glasgow, takes occasion to show by four cases, which he details: (1) that aneurisms of the aorta and of the innominate may produce laryngeal symptoms only, although collateral indications may almost always be detected on critical investigation; (2) that in the early stages the pressure may excite paroxysms of intense dyspnoea, with laryngeal stridor and paroxysmal cough; (3) that, later, paralysis is usually unilateral, and is characterized by phonative

waste of breath and imperfect cough, dyspnoea occurring only in cases of reflex spasm in the opposite side or in case of actual compression of the air passage; and (4) that tracheotomy is indicated in certain cases as a remedial agent as well as a palliative one. This tracheotomy, he contends, diminishes the risk of rupture of the aneurism in the spasmodic paroxysms of dyspnoea.

Paralysis of Adductors.—Dr. Frank Donaldson, Jr.,⁴ of Baltimore, reports an instance of this rare lesion, the left vocal band being seen in extreme abduction, immobile during respiration and upon phonation. Deafness in the left ear and loss of voice had followed an attack of severe pain behind the right ear a few months previously, so that the inference was made that a brain lesion might have been the cause of the trouble. Treatment was of no avail, and at last accounts there had been no change in the patient's condition.

A case of complete paralysis of the right vocal band in a position midway between that of inspiration and phonation, in a man 42 years of age, and due to a fibroma of the right recurrent laryngeal nerve, has been recorded by Dr. Major,²⁶ of Montreal.

Dr. G. Thermes²⁷ reports two instances of laryngeal vertigo in whooping-cough of the aged. One patient was 67 years old and the other 64. In the latter instance the diagnosis was confirmed by Prof. Charcot. They were cured with large doses of potassium bromide.

LARYNGEAL TUMORS.

Polypi.—Rossbach²⁸ reports 85 operations for laryngeal polypi, of which 79 were males and 6 females. The youngest subject was $4\frac{1}{2}$ years of age, the oldest between 60 and 70, the majority being between 30 and 60. 50 of these tumors were papillomata, 49 being solitary and 7 multiple. The remaining were fibromata and cystomata. In 2 patients there was complete hysterical and nervous anæsthesia of the larynx. Since 1867, Rossbach has used the ungarded knife and the galvano-cautery. With the sponge he could only remove two polypi. Twice he saw large cystomata disappear spontaneously, apparently by bursting. Twice in cattle dealers he saw tumors like mucous polypi, induced by overstraining the voice, give way to an incision. He describes an interesting case of tumor in the connective tissue between the trachea and the

œsophagus, and which forced the posterior tracheal walls forward in a spheroid. The patient dropped dead from his seat suddenly, just before a proposed tracheotomy could be performed. In two cases of multiple polypi, to prevent recurrence, Rossbach rubbed a 50 per cent. solution of lactic acid into the wound left by extirpation. G. A. Carpenter,¹⁹ of London, reports the removal from a girl, 18 years of age, of a subglottic growth supposed to have been congenital, as the impairment of voice dated from babyhood. Dr. MacCoy,²⁴ of Philadelphia, extols the galvano-cautery in the treatment of papilloma of the larynx, and reports an interesting case. Dr. J. Charazac²⁹ reports an instance of spontaneous ejection in coughing of a firm polypus the size of a strawberry, which had existed for probably ten years in the larynx of a female 21 years of age.

Tuberculous Tumors of the Larynx.—Dr. Max Schaeffer,⁸ of Bremen, reports the removal of such a tumor from a man 33 years of age. It occupied the posterior portion of the left vocal cord, and was of the size of a bean. Some months afterward the patient died of constitutional phthisis. The growth was examined by Dr. Dietrich Nasse, who details its histological characteristics.

Carcinoma of the Larynx.—Dr. H. A. Johnson,⁴ of Chicago, reports 5 cases, all males, more than 44 years of age. In 3 the disease occupied the right side. In but 1 was there a history of cancer in the family. In 1 only the disease seemed to be secondary or an extension of external cancer. In 1 only was there evidence of infection of the lymphatics from the larynx. In 1 only any troublesome hæmorrhage. In none was there marked pain. In 3 life was prolonged apparently three, five, and eight months respectively by tracheotomy.

Dr. Birch³⁰ reports a case of epithelioma of the epiglottis in a man 60 years of age.

Monod and Ruault³¹ presented to the Académie de Médecine a larynx containing an epithelioma of the right vocal cord. The history of the case and the character of the specimen seemed to indicate the probability that the patient could have been saved by timely division of the larynx, and extirpation of the malignant growth without sacrificing his larynx in either a total or unilateral laryngectomy.

Prof. B. Fränkel,³² Berlin, gives a cure by repeated intralaryngeal operations as required by recurrence, performed at intervals since 1881, there having been no recurrence for the two years preceding the date of the report. This case is of great clinical importance, standing alone in the history of intralaryngeal treatment of carcinoma.

The editor presented the picture of a larynx from which about twenty years ago he removed an epithelioma by external access through an incision of the thyroid cartilage anteriorly. Most of the left vocal band and the mucous membrane lining the ventricle was taken away. A compensatory tissue for the vocal band formed at the expense of the ventricle, which underwent version in the process. The patient has remained in good health and has an excellent voice.

Dr. Eugene Hahn³³ communicated the results of fifteen extirpations of the larynx, partial and complete, for carcinoma. Two of these are to be regarded as cured, both males; one operated upon seven years ago for an extensive keratoid carcinoma, at the age of 69 years, and losing nearly his entire larynx, namely, the cricoid cartilage, one-half the thyroid cartilage and a great portion of the other half, a portion of the hyoid bone and the epiglottis. This patient is completely well. He wears a canula, can make himself understood, and has enjoyed good general health ever since the operation. The other case, which may be regarded as cured, was a patient of Dr. Felix Semon, of London, who requested Hahn to perform unilateral exsection. The disease was unusually circumscribed. A microscopic section from the specimen is unusually characteristic. Except these two cases not one has remained perfectly well. One patient is perhaps yet living, but the latest report of his condition indicated a recurrence. This result is not brilliant and may be due to the fact that the operations were usually made late in the disease, as can be seen in the twelve preparations exhibited. In no other case had Hahn had an opportunity to operate at so early a date as in Semon's case.

One case, the youngest in the series, 36 years of age, was operated upon unilaterally, and the specimen was exhibited. Another specimen was from a patient upon whom Hahn had operated nine times within eighteen months for recurrences, these being always local, no lymphatic infiltration being found even at the autopsy.

In his monograph on extirpation of the larynx (1885) Hahn mentioned that, in many instances, he had found that the lymphatic glands became diseased unusually late in laryngeal carcinoma. He further believes that the carcinomas with cornifying tendencies, the so-called keratoid carcinoma, offers a far more favorable prognosis than the other forms, especially the soft ones, as is always the case in other portions of the body. The two patients cured had keratoid carcinoma. Hahn believes, therefore, that it will be of great importance for the operation in future to determine whether a carcinoma shows great tendency to cornification of its cells.

These cases should, under all circumstances, be submitted to operation as early as possible. When, on the contrary, the case is one of soft so-called infiltrating carcinoma, which shows a great disposition to disintegration, and where perhaps the soft parts surrounding the larynx are already invaded, he believes the surgeon will do better to abandon the operation and limit his interference to tracheotomy when demanded by want of breath.

In an editorial on extirpation of the larynx in the *Journal of Laryngology and Rhinology*, it is stated that the accumulated evidence of various operations has not tended to confirm the favorable results that were expected of total extirpation of the larynx, and that the table presented (103 cases) will serve to show that it is but a desperate proceeding at best. Of these 103 only nine are certainly recorded to have been living twelve months after the operation. Of eight extirpations for sarcoma four lived over twelve months. Of six extirpations for other conditions five were followed by death within five months.

The Transformation of Laryngeal Papilloma into Carcinoma.—Prof. Karl Stoerk,³³ of Vienna, has recently published two important articles, one on transformation of papilloma of the larynx into carcinoma, and the other on extirpation of the larynx for carcinoma, with the history of a successful case of his own.

Stoerk has seen the majority of the cases of malignant growths of the larynx operated upon in Vienna during the past fifteen years, has watched their course, has advised their submission to operation at the hands of Billroth, and has assisted in the operations and in the after-treatment. According to his experience, the presence of a papilloma in the larynx determines a congestive

condition which extends into the papillary bodies, which excites a catarrh of the tissues far more deeply seated and more irritating than ordinary catarrh, and with which an excessive proliferation of epithelium is associated far exceeding that produced by any other disease. Papilloma, he thinks, should be regarded as a special disease of the epithelial tissue. One is astounded, he informs us, at the first view under the microscope of the immense amount of epithelial proliferation surrounding the walls of the smallest so-called catarrhal ulcer.

With tuberculous ulcers this proliferation is still greater, and it is greatest with papillomas. It consists of very sparse connective tissue, serving only as a scaffold upon which papilloma, pegs upon pegs, accumulate. Such papilloma, even when they embrace the entire mucous membrane, may exist an entire lifetime without especially endangering the existence of the patient. Stoerk has seen individuals who have suffered for twenty-five years with papilloma and their recurrences.

In other cases peculiar changes occur after the lapse of years. The isolated peg formations gradually fade away. The papilloma loses more and more of its mobility and becomes more sessile the older it becomes. The secondary and tertiary outgrowths undergo attenuation and spontaneous detachment. The succulence of the papilloma ceases, and at its base the isolated portions undergo agglomeration and can be distinguished upon the surface as isolated dendritic outgrowths. Soon, however, the chinks at the base can no longer be recognized, and the consistence of the growth becomes changed and its mobility diminished. It hardens gradually into a fibrous tumor, redder, darker, and more copiously supplied with vessels. This darkening of the papilloma is an accurate pathognomonic indication that transformation is taking place. The next stage in development is one characteristically common to all carcinomas. The tumor is no longer movable on its base; it is, to use the expressive phrase of Waldeyer, "as though fastened to its supports with belts."

The normal proliferation outward having ceased, the proliferation of epithelium is driven into the tissues, first into all the normal interstices of the connective tissue, then between the fibrillæ of the muscles and into the walls of the vessels. The moment that but a minimum remains of the original tissue, that

process is completed which may be designated as the metamorphosis of papilloma into carcinoma. The infiltration of the muscles, vessels, and nerves produces an important disturbance of their functions, and there is a total change in the biological relations of the neoplasm. The farther the epithelial infiltration extends, the slighter becomes the vitality of the tissues, and the intense reaction occurs in its immediate neighborhood (an eliminating reaction it may be supposed) which can be most readily observed in well isolated pharyngeal or laryngeal carcinoma, in which such remarkable vascular injection is visible around the infiltrated nodules that expulsion or ulceration might be expected every moment. Only in the characteristically disturbed relations between the reactionary process in the neighborhood and the rapid increase of the epithelial proliferation, can it be realized that the seat of the reactionary process in still relatively sound tissue may in the shortest time undergo infiltration,—that is to say, may become changed into carcinomatous nodules.

As to the treatment of papilloma, Stoerk has long ago been assured that the best method is that which does not subject the diseased larynx to any great irritation. Endeavor must be made to remove the papilloma to re-establish respiration and phonation; but no irritating applications must be made to the seat of implantation. They are likely to encourage recurrences. Multiple papilloma are not dangerous. Those which are isolated are not so favorable. Such growths, recurring in the same place a year or two after careful removal, are usually associated with a predisposition to a later change into carcinoma. Their pegs proliferate so in length that the secondary pegs become pointed and tilted and wave about, so that they become detached from time to time as they shoot out too far. They are coughed out without any special hæmorrhage or painful sensation. This spontaneous detachment ceases after a series of years. No more secondary proliferations take place, and the growth, which up to this time has been pyramidal, becomes more spherical.

Hitherto the surface of the papilloma appeared rather white or pale red, uneven and dendritic; but now it becomes rounded off, and though not smooth, is covered with small lumps and usually has grayish-white, feltish covering, which is an indication that the normal papillary process has subsided. This covering gradually

changes into a dense dry one. The growth may remain long in this condition. It looks dry; it feels hard to the probe; the papilloma grows no more in height; it becomes larger at its base; it is changing into a malignant growth. Such a growth should not be attacked by any endolaryngeal method. For even the exsection of portions for microscopic purposes may be followed by increased growth; while if let alone its extension may remain circumscribed for a long time, often for years, without marring the chances of success in a radical operation.

As to the subjective manifestations of a papilloma transformed into epithelioma, they assist chiefly in disturbance of phonation, less frequently in those of glutton. Pain and hæmorrhage are not frequent. Once, however, that inefficient topical measures are instituted, hæmorrhage ensues, with extensive proliferations in height and in breadth, which produce dysphagia, dysphonia and pain. A papilloma may occupy a vocal band for years without interfering with its muscular functions, the disturbance in phonation being mechanical and due to the position occupied by the growth. In general, neither phonation nor respiration suffer complete disturbance. As soon, however, as the papilloma has undergone the changes described, the muscular apparatus becomes impaired. This immobility is a pathognomonic indication of the change of a benign neoplasm into carcinoma.

Leprosy of the Larynx.—Sir Morell Mackenzie³⁴ gives an entertaining and very instructive report upon leprosy in Europe, particularly as it affects the air passages, the results of personal studies made in Spain, Madeira, and Norway during the past few years. At his visit to the Hospital de San Lazaro in Seville, in 1880, there were 29 male patients, 9 of whom had well-marked throat affections, as had 2 out of 10 females, the peculiar features of which are tabulated. In 1 instance the throat was affected from the beginning of the disease, in the others at periods varying from two to eleven years. A constant feature was enlargement of the epiglottis. In 1 case of ten years' standing the epiglottis was entirely destroyed,—an exceptional occurrence. In 1 or 2 others there were ulcers on it, usually at the edge and toward the side. Thickening of the arytenoid cartilages was almost universal. In all, the whole upper orifice of the larynx was thickened so as to greatly narrow the aperture. In 4 cases the uvula was entirely

eaten away, in 1 it was partially destroyed, and in 3 it was thickened and enlarged. In 5 the pharynx was entirely ulcerated. In 1 tubercles were observed on the tongue. In the Lazaretto at Fundeal, visited in 1881, there were 4 males and 4 females with throat implications, the general features being almost identical with those observed in the lazarinos of Seville.

Cysts.—Major,³⁵ of Montreal, reports the removal of a small cyst imbedded in the substance of the right vocal band, at its margin, removed with Mackenzie's cutting forceps. Garel⁹ reports 16 cases out of a total of 60 morbid growths,—a proportion very much in excess of that reported by other observers. Were it not for the details given and the illustrations accompanying, the presumption might be well made that some mistakes had been made in diagnosis.

Lupus of the Larynx.—Dr. Michael Grossmann,³⁸ of Vienna, in an interesting summary reports 2 cases, 1 of which was reported in 1877, and has been under his observation ever since:—

(1) J. W., a 10 year old boy, lived for six years in a musty, damp dwelling, and left in his 7th year with moderate lymphatic tumefaction in the left submaxillary region. Following suppuration undoubted lupus vulgaris began in the edges of the ulcer, and eventually involved the entire skin of the region. After some cauterization with lactic acid under cocainization, to relieve dyspnoea, the swelling underwent spontaneous diminution for a time. Treatment by lactic acid has been continued with satisfactory results, the morbid processes subsiding much more rapidly than they do spontaneously.

(2) This was in a 27 year old female, under Neumann's care, with primary lupus of the left conjunctiva and eyeball, with extension to the wing of the nose and upper lip. She had always been hoarse. There was a large heart-shaped defect in the central portion of the epiglottis; the vocal and ventricular bands uneven, knobby, and covered moderately with granulations, and a tag of similar tissue beneath the anterior commissure of the vocal bands. No abnormality was seen in the mouth or throat, except a partial distortion of the uvula. During the ensuing ten years the laryngoscopic appearance had hardly changed, but the hard and soft palate and aperture of the pharynx had become implicated.

Sarcoma.—Dr. Louis Jurist,²⁴ of Philadelphia, reports a case of round-celled sarcoma of the larynx (Fig. 5) in a man 65 years of age, suddenly attacked with intense dyspnoea the day before the examination, though somewhat short of breath for two months previous. Laryngoscopic inspection, as seen in the illustrations, revealed the presence of a smooth, globular growth, grayish in tint, dense in consistence, of the size of a horse-chestnut, and springing from the left ventricular band. An operation at the time was declined, and the next day he died suddenly in a suffocative paroxysm, despite an immediate tracheotomy performed by a surgeon in attendance.

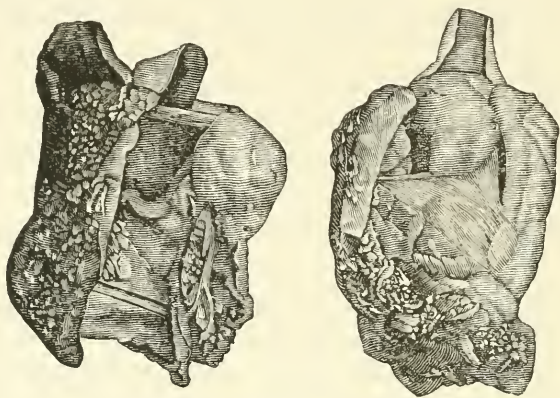


FIG. 5.—SARCOMA OF THE LARYNX.—(*Med. News.*)

Lymphoma.—Our Corresponding Editor, Dr. de Havilland Hall, of London, calls our attention to the very interesting case of lymphoma affecting the larynx, eyelid and cerebral membranes recorded by Dr. Clifford Beale.¹⁹ On making a laryngoscopic examination it was noted that the epiglottis at its free edge appeared to be normal; but immediately below it and to the left was seen a thickening of the tissues resembling adenoid hypertrophy, involving the lower part of the left side of the epiglottis, the ventricular band, and to some extent the left glosso-epiglottic fold. On removal of a small piece of the thickened tissue in the larynx by means of the forceps, it was examined microscopically and found to be simple lymphoma. Death took place from exhaustion about ten months after the commencement of the symptoms.

PACHYDERMIA LARYNGIS.

On account not only of its intrinsic interest, but of its relative association with a case in high life about to become historical, we reproduce in considerable detail a lecture by Virchow¹⁷ on this subject. He calls attention to the fact that squamous epithelium covers the mucous membrane located between the arytenoid cartilages, and then continues uninterruptedly forward upon the vocal bands to their anterior extremities. This portion of mucous membrane, like the squamous covered mucous membrane of the mouth, pharynx, and œsophagus, closely resembles the epidermoidal layers of the skin; that is to say, it possesses a more or less *cutaneous or dermoid* character. The dermoid portions of the larynx not being provided with glands are relatively dry in quality; they furnish none of the copious secretion observed in their immediate proximity; in short, they represent a domain of their own. In this region a number of processes are evolved which are not evolved in the same way on those surfaces which are clothed in the usual manner with ciliary epithelium and which possess the character of mucous membrane in its restricted sense.

There are two varieties of changes in chronic inflammatory processes in the larynx which so greatly exceed the ordinary volume of simple chronic catarrh, that they must be separated therefrom. In both varieties a greater quantity of squamous epithelium is formed. In one this is the chief change; not only quantitatively, but because the longer the process continues the more the epithelium acquires an epidermoidal character. In the other the changes occur more in the superficial layers of connective tissue, that is to say, in the mucous membrane proper. The latter produces a more diffuse swelling; the former is circumscribed in individual and usually very small points.

By virtue of the dermoid character of the affected parts Virchow has long been accustomed to group all these processes under the name *pachydermia*. Thus, there are two different forms of pachydermia laryngis: one diffuse, in which a tumefied condition of mucous membrane prevails, a relatively smooth form; the other limited to small places, more circumscribed, and which he calls warty (*pachydermia verrucosa*).

In those places where the diffuse swelling is most strongly

developed, the cartilages are very superficial and the corresponding vascularity less developed. This is especially the case in the region of the vocal process of the arytenoid cartilage, where the mucous membrane covering it passes almost immediately into the perichondrium and the submucosa is very slight. At this point very characteristic conditions of swelling occur,—a change which is not sufficiently well described in laryngological works. At the posterior end of the vocal band, where the elongated vocal process is pushed just under the mucous membrane, and just at the point where it leaves the cartilage, there is a long, oval, tumid swelling, frequently 5–8 mm. long and 3–4 mm. broad, which is directed, as the rule,

forward and downward from behind and above so that its anterior end lies under the border of the vocal band. In its middle is an elongated groove or pocket, but of small depth. (Fig. 6.)

When first seen by Virchow, he thought it due to cicatrices of ulcers which had undergone irritation around it. Careful study, however, showed him that the depressed centre marked the place where the mucous membrane was in such close connection with the cartilage beneath it, that it could be lifted off. Such a condition is frequently found in the dead body, and principally in old drunkards, and it may be due to irritation produced by their habits of singing, somewhat similarly to the trachomatous conditions

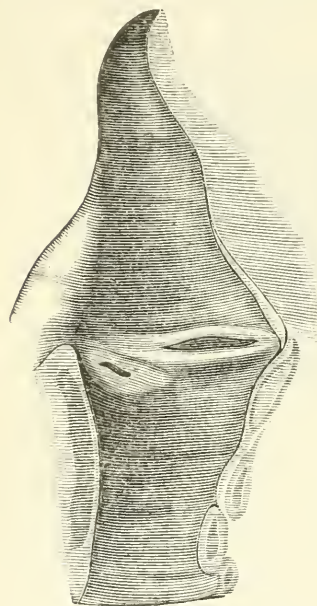


FIG. 6.—PACHYDERMIA LARYNGIS.
(*Berlin Klin. Woch.*)

of certain forms of chronic laryngitis described by laryngologists as peculiar to singers. At all events, it is a very characteristic and peculiar condition.

This change is never found alone, but is associated with a diffuse disease which extends over the entire vocal band. The whole surface is in a condition of epithelial proliferation. The thickened wall surrounding the depression is found to be infiltrated with papillæ covered with rich layers of epithelium. Microscopic examination is necessary to detect the papillæ.

(Fig. 7.) We find here a papillary development which does not normally occur in this place in such thickness. There is also usually a continuation of the disease into the interarytenoid space, where may sometimes be seen in great extent, even with the unaided eye, thick outgrowths and folds with epidermoidal coverings which present a very striking appearance in their strength and extent. (Fig. 8.) This condition is not very frequent; and but two preparations existed in Virchow's collection. These, however, were very characteristic. The very thick and hard

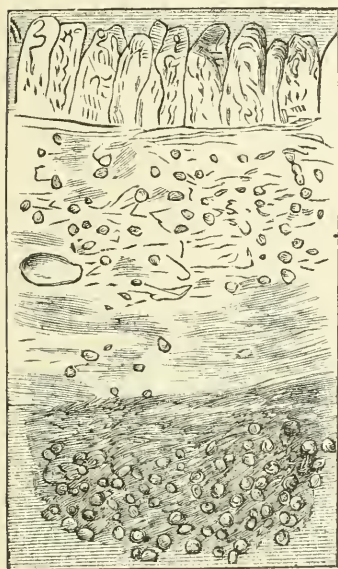


FIG. 7.—PAPILLARY DEVELOPMENT.

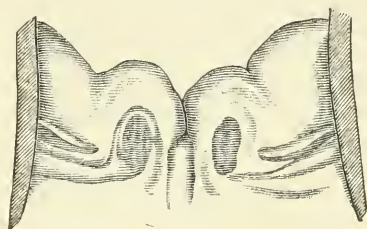
—(*Berlin Klin. Woch.*)

FIG. 8.—LESION OF THE INTER-ARYTENOID SPACE.

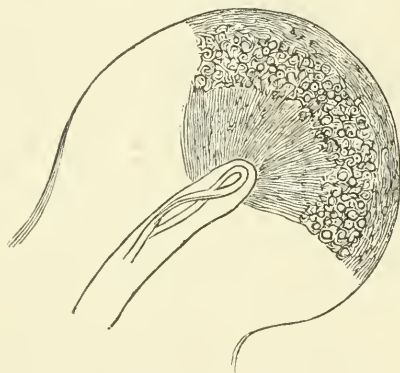


FIG. 9.—EPITHELIAL PROJECTION.

epidermic layers had become cracked and fissured. This gives them the deceptive appearance of a beginning canceroid ulcer. Virchow is not of the opinion that any such transformation takes place. When the investigation is made as to what relation the verrucosities or so-called polypi hold with this condition, it is found that the chief seat of the latter is not at the posterior portion of the vocal band, but at the middle or anterior portion where the two bands strike each other. In the best known and ordinary variety each individual projection consists chiefly of epithelium, while the papillæ which enters it occupies but a comparatively small space. (Fig. 9.)

DISEASES OF THE TRACHEA.

Carcinoma.—Primary carcinoma of the trachea is exceedingly rare. Mackenzie mentions but 2 cases,—1 reported by Langhan and 1 under his own care. In the International Encyclopedia of Surgery, the editor tabulated 11 instances,—none of them in his own practice; to which may be added 1 reported by Beebe,⁴³ a practitioner of homœopathy, and 1 recently reported by Gerhardt,¹⁷—the specimen from which was exhibited and described by Virchow to the *Berliner Medicinische Gesellschaft*, Nov. 16, 1887. The rarity of primitive carcinoma of the trachea probably insures a record of every recognized instance. Thus there is a total of but 13,—in marked contrast to the great number of published cases of carcinoma of the larynx, and the probably still greater number unreported.

Gerhardt called attention to points which might be utilized in the differentiation of carcinoma from syphilis of the trachea. The latter commences with phenomena of irritation, cough, and expectoration of masses of mucus, of blood, and sometimes of detached fragments of cartilage,—those of dyspnoea occurring much later. The recognition of syphilitic constriction in the irritative stage permits, as a rule, of its permanent relief. After the stage of dyspnoea begins, the process is attended with further constriction, by traction of the cicatricial tissue, the more that the ulceration is frequently just above the bifurcation. In the syphilitic constriction the disease began with ulceration; while in the case of cancer it evidently did not occur until some time later.

Syphilis.—Eugene Fränkel,⁸ of Hamburg, reports a case of extensive gummatous infiltration and cicatrization of the tracheal submucosa, proceeding without symptoms,—the patient, a female, 41 years of age, continuing work until within six days of her death. At the autopsy, nothing abnormal was found in the trachea above the fourth cartilage; but between this point and the bifurcation were a number of irregular, prominent ulcerating nodes, some firmly elastic, some soft and doughy, those most ulcerated being just above the bifurcation. In addition, there were a number of stellate, tendinous cicatrices uniting adjacent rings so as to prevent the separation of their walls by manipulation. The thyroid gland was not enlarged; but at the junction of its broad

isthmus and right lobe it changed into a rather dense, yellowish gray mass of $\frac{2}{5}$ centimetres in breadth, the height of 2 centimetres, and thickness of 1 centimetre, which passed into the neighboring parenchyma without any sharp line of demarkation, and was firmly adherent to the trachea, which at this point was intact in its mucous membrane. In addition, there was cirrhotic change in the upper left lobe of the lung, with a probably gummatous mass hardly the size of a hazel-nut. There were multiple fresh gummata in the liver, and other indications of active syphilis. Fraenkel very properly calls attention to the lack of knowledge of the intense sclerotic condition of the connective tissue in cases like his own, and likewise in cases associated with cicatricial stenosis of the air passages. This stenosis may not always be present; and Fraenkel suggests further studies in this direction to clear up this point.

Sopel¹⁸ reports two cases of tracheo-bronchial stricture. One was attributed to primitive tuberculosis of the peritracheo-bronchial lymphatic glands, with softening and perforation of the trachea, though primitive carcinoma of the thyroid gland was demonstrated on microscopical examination after death. The coincidence of carcinoma and tuberculosis is very unusual. The second case was due to aneurism of the aorta.

Treatment of Stenosis.—Dr. Schroetter¹⁸ describes his method of dilating stenoses of the larynx with solid tin bougies when a tracheotomy has been performed, and with perforated, triangular, outlined bougies when the air passage has not been entered externally as well as where it has. Dr. W. Lublinski,⁸ of Berlin, reported a case of stenosis of the trachea successfully treated by catheterism of the air passage. Dr. Morris J. Asch,⁴ of New York, reports a case of laryngeal stenosis treated by divulsion and systematic dilatation. Our Corresponding Editor, Dr. Gouguenheim,¹⁸ of Paris, narrates an interesting case in a female 25 years of age, cured after tracheotomy and the wearing of a canula for seven months, by the internal administration of iodides and tonics. There was a pervertebral ulceration of the pharynx.

Traumatic Tracheocele.—Dr. Ferdinand Giraud,⁴⁴ of Marseilles, reports a case of traumatic tracheocele in a female 41 years of age, the victim of a brutal attempt at murder. A cutting instrument had wounded the trachea. The external wound and that in the

trachea had cicatrized; but under the influence of a cough provoked by bronchitis, the trachea had ruptured at the point of injury, and the air had escaped into the peritracheal connective tissue.

Fracture of the Trachea.—Dr. E. C. Norton⁴⁵ reports an instance of fractured trachea in a bricklayer, who had fallen through a staging two days before, striking his throat. The patient made a complete recovery.

DISEASES OF THE ŒSOPHAGUS.

Abscess.—P. D. Turnery,¹⁹ of London, reports a case of œsophageal abscess in an infant three months old. The abscess, the size of a large walnut, was in the areolar tissue behind the œsophagus and the lower part of the pharynx. Tracheotomy had been performed two hours after the sudden onset of dyspnœa.

Stricture.—In an article on the diagnosis of stricture of the œsophagus, Ogston,⁴⁶ of Aberdeen, calls attention to the value of noting by auscultation the rapidity of the passage of food along the gullet. A healthy person, he has found, requires about four seconds for food to pass from the mouth to the stomach. In stricture it will generally require from fourteen to nineteen seconds.

Dr. Frank²² reports a case of cicatricial stricture from caustic lye, in which gastrostomy was performed, and the stricture then dilated by sounds passed into the œsophagus through the gastric fistula, and then out of the mouth, a string having been first passed through by means of a small sound passed through the stricture from the mouth, and then drawn out through the wound in the stomach. The strings in the œsophagus caused no trouble.

Mr. A. M'Phedran⁷ reports a case of gastrostomy for malignant stricture of the œsophagus; the patient, a female, 41 years of age, survived the operation six months and eighteen days, the immediate cause of death being pneumonia. The stomach was considerably dilated. The opening into it was one inch from the pylorus. The upper part of the œsophagus was dilated, the lower five inches connected with a sloughy cavity, filled with foul, grumous material. The disease implicated the aorta, bronchus, and spine.

Dilatation.—Dr. Mermod⁴⁸ reports an instance of diffuse dilatation of the œsophagus without any organic stricture. The

patient was treated by alimentation through a tube in order to prevent the sojourn of food in the œsophageal pouch, and had undergone remarkable and rapid improvement in weight, in general health, and in relief from cough, emesis, and painful sensations of emptiness and fullness.

Primary Carcinoma.—Dr. Albarran,⁴⁹ of Barcelona, reports a case of primary encephaloid carcinoma of the œsophagus, the inferior half of which was the seat of a whitish, friable, pendulous growth extending to the cardia and invading the stomach to the extent of from seven to eight centimetres. A perforation existed in the posterior portion of the œsophagus about six centimetres from the cardia. The patient had a similar tumor in the upper jaw. M. Cornaz, Sr.,⁴⁸ reports a case of cancer of the œsophagus which produced rupture of the aorta. Dr. Roux,⁴⁸ of Lausanne, reports a case of carcinoma of the œsophagus and posterior and lateral walls of the larynx, in which he made a circular resection of the œsophagus, and excised the larynx and the thyroid body. The patient, a female, 67 years of age, recovered from the operation, but recurrence took place within two months.

Dr. Sonnenbury⁸ reported a female patient in whom five months previously he had performed gastrostomy for carcinomatous stricture of the œsophagus. The fistula was near the cardia,—the best point for nourishing the patient. The patient wore a covered silver canula in the opening, which was attached to a rubber tube with a funnel when nourishment was to be taken.

Mr. Charters J. Symonds,⁶ of London, reports four cases: (1) Female, æt. 43 years. Epithelioma of œsophagus. Treatment by catheterization or tubage. Death from extension to pleura and lung. (2) Male, æt. 51 years. Epithelioma of upper end of œsophagus. Treatment by tubage. Permanent dilatation effected. Death from exhaustion and prevertebral suppuration. The total duration of stricture was six months, during nearly three of which he was under treatment. (3) Male, æt. 51 years. Rapid epithelioma of the œsophagus. Treatment by tubage. Death from extension to the trachea. (4) Male, æt. 43 years. Stricture of lower end of œsophagus, 13 inches from the teeth. At first bougies were used. Then a short tube was introduced with marked relief. He also became able to lie upon his back. The tube was left in three days, during which he was fed with liquids

only. The short tube referred to is a funnel-topped tube about six inches in length. By means of a conical bougie or a special contrivance of wire, it is passed through the stricture until the funnel rests upon its upper face. It carries a silk thread which is to be looped about the ear and retained by adhesive strips. The patient swallows down to the funnel, through which the fluids pass toward the stomach. The best form of tube is that made on a silk web. Its applicability is limited, but the comfort and relief afforded for a time are sufficient to warrant its use. It may require frequent removal on account of becoming obstructed. It may not always be possible to withdraw it. In one instance the silk thread gave way, and Mr. Symonds forced the tube down in the stomach, and it was found in the duodenum at death, 65 days later, without having caused any trouble.

In an address by Dr. E. Leyden and Dr. Renvers,⁸ before the Medical Society of Berlin, two patients with carcinomatous stricture of the œsophagus were exhibited to illustrate the unusually favorable results obtained with the use of the canula, introduced through the stricture and retained in position, according to J. Symonds⁶ method, somewhat modified and improved. One patient, a female, wore for six months a tube about the size of a goosequill, and her œsophagus became again thoroughly permeable for fluids. The other patient, a male, did still better. How long life may be prolonged by this method of treatment is as yet uncertain. Experience teaches that patients perish from inanition in ten months or thereabouts, as the rule. In the two patients exhibited nourishment had been maintained for seven months with increase of weight, general sense of feeling well, and without evidence of material progress in the disease threatening life in other directions.

Foreign Bodies.—Prof. Gardner and Dr. Joseph Coats¹⁵ report a case of perforation of the œsophagus and penetration of the aorta by a fish-bone, the patient, a man 63 years of age, dying by hæmorrhage. H. E. Bridgman¹⁹ reports an instance in which a small plate with four teeth, retained for fifteen months, was, in a paroxysm of retching, forced into the throat, whence it was withdrawn by the finger of the patient. Complete occlusion with a piece of meat has been noted by Drs. Bobbitt⁵¹ and Battle⁵² in a child 3 years of age, with a stricture the result of drinking some

lye eighteen months previously. The removal of the foreign body was facilitated by preliminary softening with digestive mixture. Dr. Cleaver⁶ reports the successful extraction with forceps of a half penny from the Œsophagus of a child 3 years of age, twelve days after it had been swallowed. In discussing the case mention was made of the happy thought of Dr. Taylor, of Hathersage, who, in a case of pin in the Œsophagus, induced a little girl, with small hand and arm, and long, tapering fingers, to pass her hand down the Œsophagus, when she succeeded in detecting and removing the pin. Dr. Berne,¹⁷ of Amsterdam, reports two successful cases of Œsophagotomy for extraction of false teeth. He thinks that the mortality in cases submitted to this operation is due less to the procedure itself than to injuries sustained by the Œsophagus from the sharp edges of the plate, and therefore advises great prudence in such manipulations, with resort to Œsophagotomy as soon as possible. Mr. Bennett May⁶ reports a successful case of Œsophagotomy for the removal from the thoracic cavity of a half penny, which had been swallowed three years and a quarter previously. The foreign body had perforated the trachea or bronchus, the opening into which it had occluded, for when dislodged a rush of air into the Œsophagus took place. The case seems unique in this respect. Prof. de la Sota,¹ of Seville, reports a case in which a bone was impacted at the junction of the superior and middle third of the Œsophagus, whence it was extracted by external Œsophagotomy.

Dr. George Fischer,⁵³ of Hanover, has published an analysis of 79 cases of Œsophagotomy for foreign body, 62 of which terminated successfully and 17 of which were fatal. Dr. E. Burke Haywood,⁵¹ of Raleigh, N. C., reports an unsuccessful case of external Œsophagotomy in an insane subject for the removal of an impacted foreign body, which could not be dislodged even after the operation. The body finally passed into the stomach and was voided from the bowel. The patient died of septicæmia one month and eight days after the operation. Dr. M. H. Richardson,⁵⁴ to remove a toothplate looped in the lower portion of the Œsophagus, made an opening into the abdomen large enough to admit his forearm, opened the stomach sufficiently to pass his first and second fingers through the cardiac orifice into the Œsophagus, and removed the plate in that manner.

Dr. Wm. T. Bull,⁴ of New York, reports a successful case of gastrotony for the digital exploration of the œsophagus, and the removal therefrom of a foreign body. A peach-stone had become impacted in the œsophagus of a colored boy, 4 years of age, at the distance of thirteen inches from his teeth. A median incision three inches in length, extending from the level of the ninth costal cartilage to a point two inches above the umbilicus; an incision one inch and a quarter into the stomach; the insertion of the index finger into the œsophagus until it reached the foreign body pressed down from above by a bougie; the passage of a slender bougie through the stomach and out through the mouth; the attachment of a piece of sponge to the lower extremity of this bougie; and the withdrawal of the bougie by the mouth bringing up the foreign body, comprised the steps of this interesting and unique procedure. Invagination of the abdominal walls and of the stomach by pressure with the fist permitted access of the extended forefinger into the œsophagus, without introduction of the hand into the cavity of the abdomen.

TRACHEOTOMY.

Some recent interesting discussions in Paris as to the propriety of resorting to anæsthesia in the performance of tracheotomy in cases in which the respiration is impeded, having elicited considerable comment, Dr. R. Pichevin²⁰ reviews the entire subject in an elaborate article, of which we summarize the conclusions:—(1) Almost all tracheotomies in France are performed without anæsthesia; (2) elsewhere chloroformization seems to be the rule; (3) the enthusiasm of many surgeons for chloroform proves that its anæsthesia is not as dangerous as is the common belief; (4) the advantages of anæsthesia lie in calming laryngeal spasm, and in suppressing the agitation of the patient: it permits of slower and therefore more careful manipulation, and thus lessens the liabilities to immediate accidents by hæmorrhage; (5) the inconveniences and dangers of anæsthesia consist in exaggeration of laryngeal spasm, the primitive or laryngo-tracheal syncope, the introduction of great quantities of blood into the trachea of a person whose individual reflexes have disappeared; (6) chloroform should not be given in all cases; (7) anæsthesia is indicated in preliminary tracheotomies, in cases of foreign bodies, in cases of great difficulty in immo-

bilizing the patient, in cases of great thickness of the soft parts and consequent difficulty in reaching the trachea, and when the salient portions of the larynx are not well determined, and in the absence of competent assistance; (8) anæsthesia is contra-indicated in advanced stages of asphyxia, in extensive or serious disorganization of the lungs, in certain lesions of the heart, and in most instances of great courage in the patient; (9) in many cases it is difficult to fix any rule. If the operator is expert and has good assistance he may abstain from anæsthesia. If he fears complications he had better resort to it; (10) chloroform is always preferable to ether; (11) chloroform should be given very cautiously; if there be any prolonged aggravation of bad symptoms, anæsthesia should be arrested and the trachea be immediately opened; (12) the third stage of surgical anæsthesia should be awaited before the knife is used; the muscular resolution and the state of the pupil indicate that the operation may be begun.

We may refer in addition to a valuable critical review of the subject by Broca and Hartmann,⁴⁴ which is historical as well as argumentative. They conclude that in adults anæsthesia need not be insisted on if the patient be courageous; otherwise there should be no hesitation. If the patient be insensible from asphyxia, then there is no question of narcosis. In children asphyxiating with croup there is no time for anæsthesia, and besides, there is insensibility already. Before the period of asphyxia has begun and there are paroxysms of suffocation, anæsthesia should be given.

Drs. Robert W. Lovett and John C. Munroe,³³ of Boston, give the results of 327 cases of tracheotomy for croup performed at the Boston City Hospital from 1864 to 1887. Of the 327 cases 232 died and 95 recovered. The causes of death were: septicæmia in 60 cases, extension of the diphtheritic process in 110, exhaustion in 10, death on the table in 10, heart-failure in 6; pneumonia, peritonitis, scarlet fever, nephritis, embolism, and marasmus each in 1; undetermined in 35.

Mr. Walter Whitehead,¹⁹ of Manchester, proposes the following method, which in some respects resembles the so-called bloodless method of Bose:—The head of the patient being bent well back over a pillow, an incision rather longer than usual is made as deep as the interval between the sterno-hyoid muscles. The scalpel is laid aside and the raspatory is used to expand the trachea,—the

isthmus of the thyroid gland being pushed downward if necessary, the rings of which can be seen glistening at the bottom of the wound. The trachea can now be readily fixed between the left index finger and thumb and be opened to the desired extent. There is little, if any, difficulty in introducing the canula, since the trachea can be so steadily fixed, and the incision into it be so clearly seen. The advantages claimed are: ease in performance; small number of instruments required; the manner in which the four difficulties are met,—of reaching the trachea, hæmorrhage, opening the trachea and introducing the canula.

To reach the trachea promptly and surely, Mr. Leonard Braddon⁵⁵ gives the following directions. With the thumb and fingers resting firmly on the skin on each side of the site for the incision, the tissues are to be drawn in with them toward the median line, a little additional pressure being exercised posteriorly as the sides of the trachea are approached, so that the ends of the fingers and the end of the thumb almost meet behind the larynx. All the great blood-vessels and the vertebral bodies are thus protected, the windpipe itself starting forward and standing out prominently under the skin as superficially as could be desired, and as perfectly under control as possible.

The rapid method of de St. Germain, in which the trachea, skin and parts intervening are incised at one stroke, has had few partisans outside of Paris and France. Dr. Egidi⁵⁶ had occasion to resort to this method of operation in an emergency, upon a child 4 years of age, in the asphyctic stage of croup. This experience showed the writer the value of this method under certain conditions, despite its dangers, which are not to be disregarded.

Granuloma after Tracheotomy.—The formation of granuloma after tracheotomy is a well-known factor in preventing removal of the canula after recovery of the patient from the affection which rendered the operation requisite. Prof. Karl Stoerk,²² of Vienna, discusses this subject in connection chiefly with tracheotomy for diphtheria in children. The development of granulation growths is due to prolonged retention of the canula, plus a disease of the mucous membrane remaining after subsidence of the inflammatory process. The granulations are not in direct association with the incision in the trachea. They are mostly immediately beneath the glottis and on the posterior wall of the

larynx, where the inflammation is always the severest, and where the erosion is most likely to ensue from long retention of the canula. The mucous membrane above the canula, deprived of the normal current of air, suffers great change. Therefore Stoerk employs canulæ which favor the passage of atmospheric air over the parts above the canula. They are made of metal. The inner canula has the ordinary fenestrum. The outer canula (Fig. 10) has a similar series of sieve-like orifices instead of the ordinary fenestrum. When first introduced an inner canula, perforated at its terminal extremity, is used as a conductor.

Since using these canulæ Stoerk has had no trouble from granuloma. It sometimes happens, however, that suffocative paroxysms are due to reflex contraction of the laryngeal muscles. In such cases Stoerk either inserts a blind canula into the opening and retains it until all danger from this source has subsided, or he inserts a peculiar, bent, thick, silver sound, with a perforated collar at its free end to attach the tapes to. When, after the expiration of some eight days, normal respiration becomes re-established, the sound is withdrawn and there is no longer any danger of suffocation.

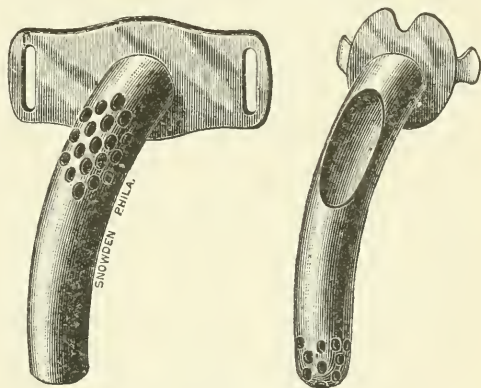


FIG. 10.—STOERK'S CANULA.

Sequelæ.—Secondary hæmorrhage is an occasional cause of death after tracheotomy. M. Bougu,⁵⁸ of Rouen, reports an instance in an infant five years of age, on the eighth day after a tracheotomy for croup.

Perforation of the Trachea by a Canula.—Dr. Williams Freeman⁶ exhibited a specimen showing a communication between trachea and œsophagus from pressure of a silver tracheotomy tube.

LARYNGECTOMY.

At the ninth annual meeting of the American Laryngological Association, the editor⁴ described a modified laryngectomy. The

following are the detailed steps: (1) Make an incision from the hyoid bone to the lower border of the cricoid cartilage, and exactly in the middle line. (2) Carefully separate the sterno-hyoid muscles. (3) Hold the soft parts aside and insert one blade of a strong cutting forceps with narrow blades from above, beneath one wing of the thyroid cartilage, one-fourth of an inch from the angle of junction with its fellow, and sever the cartilage vertically its entire length through to the crico-thyroid membrane. (4) Make a similar cut on the opposite side. (5) Seize the freed angular portion of the thyroid cartilage, comprising its entire respiratory contingent, with a volsella forceps and draw it to either side, the soft parts being separated meanwhile from the inner surfaces of the detached wings of the thyroid cartilages with the handle of the scalpel. (6) Make a transverse cut to sever the cricoid cartilage from the trachea. [At this step, a sterilized cotton plug should be inserted into the upper end of the trachea, preliminary tracheotomy having been performed previously.] (7) Lift the cricoid cartilage forward and carefully separate it with the edge of the knife from the inferior cornua of the thyroid, laterally and superiorly, and then from the œsophagus posteriorly. (8) Insert a finger into the pharynx from below and carry its tip over the epiglottis to draw that structure down. (9) Divide the thyro-hyoid membrane and the fibrous tissues still holding. (10) Lift out the excised respiratory portion of the larynx.

Advantages alleged for this procedure: (1) Its rapidity, ease and comparative safety to the patient. (2) The small size of the wound. (3) The preservation of the attachments of the thyro-hyoid ligament and the greater part of the membrane, and of the thyro-hyoid, sterno-thyroid, stylo-pharyngeus, and inferior constrictor muscles; leaving (4) important functional structures retained in their normal relations for deglutition; and leaving (5) a firm, natural support for the adjustment of artificial substitutes for the larynx. For these reasons it is submitted that this procedure should be preferred to complete laryngectomy whenever not precluded by extent of disease.

Unilateral Laryngectomy.—Mr. Lennox Browne,⁶ of London, has reported an interesting successful case of partial excision of the larynx on account of intralaryngeal epithelioma. While Mr. Browne is not an advocate of complete extirpation of the larynx,

as opposed to the palliative operation of tracheotomy in extensive disease, he is an earnest advocate of the unilateral operation when the disease is confined to one half of the larynx. He urges caution in the selection of subjects for the operation, and considers it indicated in unilateral and intralaryngeal epithelioma, and in recent non-infiltrating sarcoma. He deems it useless in pharyngolaryngeal epithelioma, and in cases with implication of the cervical glands, and of the structures adjoining the larynx.

Dr. A. G. Gerster,⁴ of New York, removed the left half of the larynx from a man, 57 years of age, who consulted Dr. Gleitsmann on account of huskiness of voice, painful deglutition and cough. A tumor the size of a hen's egg was observed below the angle of the jaw on the left side, and a growth the size and shape of an almond involved the left vocal band. On March 18, 1885, Dr. Gerster removed the infiltrated submaxillary glands, and in April following removed the upper portion of the left half of the larynx. The patient was discharged on May 13th, and had remained in good health ever since, now nearly two years. The tumor was a sarcoma. This case is additionally interesting on account of the involvement of the lymphatic glands, which is unusual in sarcoma. Dr. W. Gardner,¹⁹ of Adelaide, South Australia, reports a successful case of excision of the larynx of a man, 60 years of age, for malignant disease of the larynx. Recurrence took place about four months later, but the patient was living in comparative comfort at the end of the fifth month. Mr. Rushton Parker⁶¹ reports a case of partial excision of the larynx for epithelioma in a man, 39 years of age, in whom several operations had been performed, the patient remaining in a very precarious condition. Subsequently his death was recorded. Dr. Dupont,⁴⁸ of Lausanne, performed complete extirpation of the larynx of a man, 52 years of age, successfully for carcinoma, removing the epiglottis and a portion of the posterior wall of the pharynx, as well as a portion of the right submaxillary gland and some ganglions on the left side. Prof. Karl Stoerk,²² of Vienna, reports in detail a case of extirpation of the larynx for carcinoma, with restoration of normal voice and respiration.

Dr. D. Hayes Agnew,²⁴ of Philadelphia, reports a case of excision of the larynx and portions of the pharynx for tubular epithelioma without preliminary tracheotomy, in a man, 58 years

of age. Death ensued from exhaustion on the fourth day. Dr. J. H. Brauham⁶² excised the larynx of a man for epitheliomatous growths, the patient dying from a low form of pneumonia about two days later. Death so early is usually from exhaustion, pneumonia not setting in until later. Mr. Jordan Lloyd¹⁹ reports a case of extirpation of the larynx, without preliminary tracheotomy, for intralaryngeal outgrowth, probably of tuberculous origin, in a man 51 years of age, death occurring from broncho-pneumonia six days after the operation. We fail to gather from the report the reason why this severe operation was undertaken in preference to tracheotomy.

REFERENCES.

1. Revue de Laryng. 2. Arch. f. Mikr. Anat. 3. Bull. d. l. Soc. Anat. 4. N. Y. Med. Jour. 5. Med. Record. 6. Brit. Med. Jour. 7. Canadian Pract. 8. Deut. Med. Woch. 9. Le Progrès Méd. 10. La Semaine Méd. 11. Cinn. Lancet-Clin. 12. Report of Dr. de Havilland Hall. 13. Pacific M. and S. Jour. 14. Inter. klin. Rundschau. 15. Glasgow Med. Jour. 16. Bristol Med. Chir. Jour. 17. Berlin. klin. Woch. 18. An. des Mal. de l'Oreille, etc. 19. Lancet. 20. Jour. Am. Med Assoc. 21. Arch. de Méd. et Pharm. Milit. 22. Wien. Med. Woch. 23. Dent. Med. Zeit. 24. Med. News. 25. La France Méd. 26. Canada Med. Rec. 27. Jour. de Méd. de Paris. 28. Corr. Blatt Allg. Ver. Thüringen. 29. Gaz. des Hôpitaux. 30. Indian Med. Gaz. 31. Gaz. Hebdom. de Méd. et Chir. 32. Arch. f. klin. Chir. 33. Am. Jour. Med. Sci. 34. Jour. of Laryng., etc. 35. Rep. of Corr. Ed. 36. Wien. Med. Presse. 37. Report of Dr. Massei, Corr. Ed. 38. Med. Jahrb. der k. k. Gesell. 39. Jour. de Méd. et Chir. 40. Cent. f. Laryng. 41. Revue Mens. des mal. de l'Enfance. 42. Edinburgh Med. Jour. 43. Hahnemann Med. Jour. 44. Revue de Chir. 45. Boston M. and S. Jour. 46. Med. Chronicle. 47. Am. Lancet. 48. Revue Méd. d. l. Suisse Romande. 49. Gaceta Méd. 50. Weekly Med. Review. 51. N. C. Med. Jour. 52. Med. and Surg. Rep. 53. Deut. Zeit. f. Chir. 54. Med. Press and Circ. 55. Columbus Med. Jour. 56. Gaz. Med. di Roma. 57. Polyclinic. 58. La Normandie Méd. 59. Inaug. Diss., Berlin. 60. Ill. Monatsch. Aerzl. Polytech. 61. Liverpool Med. Chir. Jour. 62. Maryland Med. Jour.

[Undated references apply to journals published in 1887, and original articles can be found by consulting the indexes of the respective publications.]

DISEASES OF THE THYROID GLAND.

By JOHN GUITÉRAS, M.D., PH. D.

CHARLESTON.

THE THYROID GLAND has been the subject of numerous recent investigations. The congenital absence of the organ is mentioned by Virchow¹ as an extremely rare anomaly. The condition of the gland, however, needs investigation in cases of congenital cretinism and so-called congenital rickets. These affections are very much akin to myxœdema, and myxœdema has been found to be intimately connected with atrophy or extirpation of the thyroid gland.

A case is described by Fränkel² of congenital absence of the right lobe of the thyroid. The left lobe was hypertrophied, and some accessory glands were observed on the right side below the hyoid bone. Bruns³ reports a case (the fourth in medical literature) of *struma intratrachealis*, or congenital development of thyroid tissue inside of the trachea. The existence of accessory thyroid tissue deserves special attention, for it appears to explain, in some cases at least, the conflicting results obtained after extirpation of the thyroid gland. Thus Philipeaux, Kaufman and Tauber obtained negative results. Fuhr, however, has confirmed quite recently the investigations of Schiff, Wagner and others.⁴ He concludes⁵ that the former observers could not have removed the gland in its totality. He experimented on nine dogs. One died of secondary hæmorrhage. Seven died in from two to twenty-one days, with tremors, spasms and atrophy. One dog survived the operation, and a subsequent examination revealed the existence of accessory thyroid glands. Fuhr further proved that the same results could not be obtained by experimental interference with the adjoining nerves and arteries, nor by partial extirpations, unless more than two-thirds of the gland were removed. The experiments of Horsley on monkeys establish beyond question that the removal of the thyroid induces in these animals a condition identical with human myxœdema. This observer has shown⁶ that the

phenomena are not due to a primary disturbance of the nervous system, as supposed by Schiff and Herzen, but to nutritive changes that follow the extirpation of the gland. He believes, then, that the gland has some controlling influence over the metabolic processes, which influence, being removed, the albuminates remain in the state of mucin. In one of his experiments as much as 0.8 pro mille of mucin was found in the blood. Horsley has proven, besides, that the thyroid has a hæmatopoietic function. He has demonstrated the existence in the organ of lymphatic tissue, and its intimate connection with the blood-vessels, after the pattern of the Malpighian bodies of the spleen. He finds that the blood of the thyroid vein is richer in corpuscles than that of the artery. This last observation is not accepted as conclusive by Virchow or Waldeyer.

Ewald⁷ found that the injection of thyroid juice produced symptoms of poisoning with hypnotic effects; and Schiff found that the introduction of a thyroid gland into the abdominal cavity enabled a dog to resist the operation of extirpation. Dr. Angel Pulido, of Madrid, Corresponding Editor, states that Dr. Rubio,⁸ of that city, believes that the thyroid gland has for its function the destruction of mucin. Waldeyer⁹ opines that the gland has a special controlling action over the cerebral circulation. He believes that the capillaries belong to the class designated by Ranvier as diverticula forming capillaries. The branches of the superior thyroid artery perform this function for the carotids, and those of the inferior for the vertebral arteries. He observes that in those animals in which the vertebral arteries take an insignificant part in the cerebral circulation, both thyroid arteries take their origin from the carotids. Rogowicz¹⁰ believes that the symptoms consequent upon extirpation must be due to poisoning with some substance which is normally removed by the thyroid gland.

GOITRE.

Pathogenesis.—The influence of pregnancy and parturition upon the development of goitre has been investigated by Burine and De Soyre.¹¹ Dr. Giles¹² reports upon the endemic goitre of the Himalayas. About 5 per cent. of the inhabitants are affected in certain regions. The geological features are ranges of granite and gneiss and poor timber lands. The sufferers, however, were

the inhabitants who lived in mud-holes. The members of Lockhart's expedition who lived in better hygienic conditions were not affected. Dr. Josiah Williams¹³ believes that the disease is caused by the metalliferous earths that are found without exception in the magnesian limestone districts where the disease prevails. In the valley of the Vilcamayo, according to Dr. Antonio Lorena,¹⁴ the disease is circumscribed to the inhabitants who feed exclusively on maize. The disease is absent where the roads have opened the valley to commerce, and the inhabitants use a mixed diet. A. T. Sloan¹⁵ reports some cases of hereditary transmission, and gives some information concerning the disease in the lower animals.¹⁶

Morbid Anatomy.—A case of hypertrophic goitre was reported¹⁷ to the London Pathological Society, in which numerous accessory tumors of goitrous tissue were found in several localities. The thyroid gland presented some fibroid induration and lime infiltration, beside the multiple saccules occasionally containing colloid matter. The tumors found in the skull all originated from the diploe. The largest was seated over the torcular Herophili, projecting both from the internal and external table.

Symptoms.—Several cases of acute enlargement of the thyroid were reported to the London Clinical Society;¹⁸ one by Thomas Barlow, of a boy 3 years old who was recovering from an attack of erythema nodosum. The thyroiditis came on suddenly with a temperature of 103°, and lasted in its acute phase four days. Complete resolution occurred in two weeks. Another and fatal case of acute goitre was reported by S. Mackenzie. The gland was the seat of a recent hæmorrhage, and the kidneys were found in the condition described as the large white kidney. Dr. Berry remarked upon the comparative frequency of these acute enlargements about the age of puberty. Of 27 deaths from this cause, 12 had occurred between the ages of 13 and 16.

Charles Caldwell¹⁹ observed three consecutive transverse presentations in a woman with goitre, who had to sleep in the sitting posture. The previous labors had been normal. In a case of Dittrich's²⁰ an enormous cyst filled the right half of the chest. The tumor was connected with the right lobe of the thyroid gland. The contents consisted of a brownish fluid in which were found fat drops, fatty epithelium, red and white blood cells, and an abundance of cholesterine. A suppurating cyst of the thyroid

with adhesions to and ulceration of the cervical blood-vessels is described by Lejars and Leroy.²¹ Another is reported by Romaine,²² terminating in spontaneous recovery by suppuration. An interesting case is reported by G. F. Hulbert²³ of colloid and cystic degeneration of the thyroid, which seems to have originated in a phlebitis of the veins of the neck occasioned by a blow. The duration of the growth was four months. The tumor had contracted many adhesions, involving the clavicle and the intervertebral substance. The history presents many of the features of malignant disease of the thyroid.

Treatment.—The treatment by iodine injections has been successfully employed by several practitioners. The details of the operation are given by Duguet.²⁴ The ordinary hypodermic syringe is employed. The needle is introduced, detached from the syringe, into the most central or fleshy portion of the tumor to the depth of 2 or 3 centimetres. If there be a flow of pure blood, the needle must be introduced elsewhere; if of other fluids they should be aspirated through the same needle before injecting. The injection of the tincture of iodine is now made very slowly, watching meantime the effect upon the patient. The first doses should not exceed one half syringe-ful. Local reaction, radiating pains, and even fever, may follow. One injection has been sufficient to produce a cure in some recent cases. In others the operation has been repeated every eight days. Out of 34 cases (28 solid and 6 cystic tumors) 21 have been cured, 7 improved, and in 6 the result is not known. All recent goitres, whether solid or cystic, are cured by a few injections. Of the chronic cases only two were radically cured.²⁵ Good results have also been obtained by Terrillon and Sabileau,²⁶ by Morris²⁷ and others.²⁸ G. M. Giles,²⁹ of India, has used a watery solution of iodine 300 times, and finds the treatment efficacious and harmless. Tivy³⁰ has injected 290 times in 33 cases without any bad results. All the tumors were reduced in size, and the majority cured in from three to six months. Bruns,³¹ on the other hand, reports two cases of Müller in which the injection of cystic goitres caused grave asphyxia, fatal in one case. The same accident in one case led A. Wörner to reject this treatment whenever he finds evidences of disturbed laryngeal innervation. Complete failures of the iodine method have been reported by Terrillon³² and others.³³ The

injections of ergotin and of 5 per cent. solutions of carbolic acid are recommended by Baurens³⁴ and O. E. Haven.³⁵ J. Smith³⁶ treated successfully a cystic goitre by evacuation, and injection of diluted tincture of the chloride of iron. The trocar was left in place until suppuration set in, and the abscess was treated by drainage.

The internal administration of iodoform and of arsenic is recommended by Beau³⁷ and by Snow.³⁸ Massei,³⁹ our Naples Corresponding Editor, advocates the use of galvanism. Local applications of Thuja are recommended from the Pacific coast.⁴⁰

Reverdin and Kocher discovered that the surgical removal of the thyroid was frequently followed, in varying periods of time, by the development of a cachectic condition. In some cases this was found to be progressive, and to have a fatal termination. These unfavorable results have given rise to a number of surgical procedures for the cure of the goitre without total extirpation of the gland. The ligation of the thyroid arteries has been revived. A. Wölfler⁴¹ proposes the ligation of the inferior thyroid as it passes behind the anterior border of the scalenus anticus muscle, at the point where the vessel changes from a vertical to a more horizontal position. The artery is found here under the deep cervical fascia, as the latter spans the space from the scalenus anticus to the longus colli muscle. The anterior border of the sterno-mastoid, or the line of the carotids, or the junction of the middle and inner thirds of the clavicle, may be taken as guiding points for the operation. When the tumor is very large, dislocating the sterno-mastoid muscle, Wölfler makes the incision along the outer border of the tumor. The necessity of pushing the tumor toward the median line during the operation causes at times pressure on the trachea. Drobeck⁴² proposes to make the incision along the posterior border of the sterno-mastoid muscle. Ligation of the two thyroid arteries of one side by Wölfler was followed in one case by shrinkage of the goitre on both sides. Dr. Bayer, our Prague Corresponding Editor, reports that in a case of cancer, the operation failed from deficiency of the collateral circulation.⁴³ Obalinski, of Krakow, ligated in one case of parenchymatous goitre the two arteries of one side, and in another the four arteries. The results were satisfactory.⁴⁴ Weinlechner ligated successfully the two superior thyroids.⁴⁵ Some operators have combined the ligation of the arteries with removal of portions of the tumor, or with the opera-

tion for enucleation. Eugene Hahn,⁴⁶ after exposing the tumor, ligated the two superior thyroids, and applied the compression artery forceps to the inferior, thus making a bloodless operation of the removal of a portion of the gland. The forceps were removed twenty-four hours later.

The operation of enucleation, first applied to solid tumors of the thyroid by Socin, of Basle, has met with general acceptance. Albert Heydenreich,⁴⁷ of Nancy, contributes a full résumé of this subject. The majority of parenchymatous goitres, Socin found to consist of capsulated tumors. The glandular tissue is often spread out over these nodules. Several incisions may be necessary to remove separate tumors. Compression is generally sufficient to arrest parenchymatous hæmorrhage. If a deep layer of gland tissue has to be traversed, it is best to guard against hæmorrhage by the use of the hæmostatic forceps. A drainage-tube is subsequently introduced and the wound in the gland closed with catgut.

The results obtained by Socin are reported by Garré⁴⁸ and S. Keser.⁴⁹ The number of patients operated on is 59. Total extirpations 5, with 1 death. 17 partial extirpations, 17 enucleations of cystic, and 20 of parenchymatous tumors, without a single death. A summary of the different operative procedures is given by J. L. Reverdin.⁵⁰ Enucleation has been performed by Obalinski,⁴⁴ Hahn⁴⁶ and Wolff,⁵¹ who has obtained union by first intention in 11 out of 12 cases. Wolff⁵² reports that the removal of one half of the gland has been invariably followed by atrophy of the rest of the tumor. Cases of partial and total extirpation are reported by Rubio,⁸ Hofstetter,⁵³ Morris,⁵⁴ Terrillon,⁵⁵ Wolff,⁵⁶ Poncet,⁵⁷ and Weideman,⁵⁸ who gives the results of 25 operations performed at the Augusta Hospital.

The removal of the isthmus, as recommended by Sidney Jones, was performed with marked relief of urgent symptoms by Jackson.⁵⁹ Mayo Robson⁶⁰ treated successfully a cystic goitre by incision, scraping of the walls, stitching of these to the skin, and packing with zinc lotion. Tracheotomy was performed by J. B. Hurry⁶¹ and Terrillon.⁶² In a case of Dr. Rubio⁸ there was a diffuse enlargement, with ulcerated, bleeding surface, and extensive adhesions that made extirpation impossible. Cauterization by various means failed, until chromic acid was used with remarkably good effect. The acid acted as a hæmostatic without producing

eschars. A few applications brought about the development of healthy granulations, and a complete recovery in six weeks.

OPERATIVE OR SURGICAL MYXŒDEMA.

All surgical interference with the thyroid gland may be followed by a more or less marked development of this condition. This was first pointed out by the Reverdins, of Geneva, and by Kocher. The latter has given it the name of *cachexia strumipriva*. The disease is more frequent and more intense when the gland has been removed in its totality. The symptoms are identical with those of myxœdema, and with those following the experimental extirpation of the gland in the lower animals. In children the operation may be followed by an arrest of development. A similar condition may occur idiopathically, and has been described by Bourneville and Bricon, under the name of "*Idiocy complicated with the pachydermic cachexia*."⁶³ The opinion of Horsley as to the nature of these symptoms has been given. Gruzner⁶⁴ advances a similar theory. Kocher believes that there is a primary arrest of the growth of the trachea, and a consequent deficiency of the supply of oxygen. A case of Hans Schmid⁶⁵ confirms this view as relates to changes of the trachea. Our Bologna Corresponding Editor, Dr. Albertoni, and Tizzoni, found a diminished amount of oxygen in the blood.

J. L. Reverdin⁶³ gives a résumé of the results obtained by different surgeons. Of 95 cases of the various operations mentioned in this paper, 30 were followed by surgical myxœdema. Trombetta, of Messina, who has gone over the literature of the subject, finds a percentage of 27. On the other hand, no cases are reported from the Vienna clinic, and Bottini has operated on 52 cases without having a single case of surgical myxœdema. The conclusions of Reverdin are: (1) That the accidents following the operation are identical with the disease called myxœdema. (2) Operative myxœdema is observed in adults as well as in children. (3) There are different grades of operative myxœdema; one progressive, with or without intermissions, another attenuated and susceptible to improvement, if not cure, and a third which may be called the light or abortive form. (4) Long intermissions may occur, even if the extirpation was total; and in two cases at least, this has amounted almost to a cure. In these two, however,

tumors have appeared in the thyroid region. (5) The partial extirpation may be followed by abortive forms of myxœdema. (6) The extirpation of one lobe may be followed by atrophy of the other, and symptoms of myxœdema. It will be seen, therefore, that, whereas in the experiments upon the healthy gland, a partial extirpation is apt to be followed by a compensatory hypertrophy of the opposite lobe, in diseased conditions the opposite is apt to happen. (Bergmann.)

In deciding as to the propriety of extirpation, we should endeavor to determine what the functional capacity of the gland may be in each individual case. Dr. Rubio,⁸ of Madrid, classifies the cases as follow:—

There may be (1) integrity of function, with anatomical integrity, complete or partial; (2) abolition of function, by total atrophy or total anatomical alteration; (3) perturbation of function, by hypertrophy or partial disorganization.

In the first class, the rapid suppression of the organ would produce the same results as the experiments of Horsley on monkeys, namely, a myxœdemic cachexia. In the second class, if there is total atrophy, of course, no one will think of extirpation. These, he thinks, must be the cases of primary myxœdema developing spontaneously. If, on the other hand, the abolition of the function depends on a total anatomical alteration, the organism is more or less modified, according to the degree of accommodation that it has reached. If the compensation has been sufficient, the operation is advisable, if not, it can do neither good nor harm. In the third class, when the function is disturbed by a considerable hypertrophy or partial disorganization, not only is the mucin allowed to remain in the blood, but probably other deleterious materials are added to it. In such case the extirpation is beneficial.

Our knowledge of the morbid anatomy of surgical myxœdema is imperfect. A case is mentioned by Bruns⁶⁶ of a man who died at the age of 24 with symptoms of myxœdema, having been operated on when he was 10 years old. The autopsy revealed the presence of leptomeningitis with involvement of the cortical substance.

The Myxœdema Committee of the London Clinical Society has sent out circulars requesting those who have extirpated the thyroid gland to give their experience as to the effects of the operation. The circular is accompanied with a description of the

disease, from Ord's article in Quain's Dictionary of Medicine, and a photograph of which is reproduced on the next page.

MYXŒDEMA (ORD) OR PACHYDERMIC CACHEXIA (CHARCOT).

All the new material concerning the pathogenesis and morbid anatomy of this disease has been given in the preceding pages. An interesting summary, based on the observations of Horsley, will be found in Virchow's address, already referred to. The experiments of Horsley, and the contributions of the Reverdins and Koher, have awakened great interest in the subject of idiopathic myxœdema. The disease, first described by English physicians (Gull, 1874), has been recognized at different places on the Continent, and during the year numerous cases have been reported. The cases collected during the year are briefly tabulated, as follow:—

CASES OF MYXŒDEMA.

REPORTER AND REFERENCE.	NATIVITY.	SEX.	AGE.	HISTORY.*
†Kiellan ⁶⁷	Norway	F	41	{ Scrofula. Congenital heart disease. Menorrhagia. Improvement. Pregnancy. Abortion.
†Kiellan ⁶⁷	Norway	F	35	{ Sister of above. Scrofula. Improved by residence in Alps of Norway.
Zielewicz ⁶⁸	.....	M	61	{ Sclerosis of liver, spleen and kidney.
Savill ⁶⁹	.....	M	30	{ Prostatic hæmorrhage. Thyroid gland atrophied.
Paton ⁷⁰	Scotland	F	47	{ First case reported from Scotland (?).
Warfoinge ⁷¹	Sweden	M	19	{ Cured in about 3 months by arsenic and hot baths.
Handfield Jones ⁷²	England	F	.....	{ Preceded by long-standing menorrhagia.
Erb ⁷³	Germany	M	29	{ Second case reported in Germany, after one of Dr. Reiss.
Erb ⁷³	Germany	F	35	{ Third case in Germany. Menopause at 28. First symptoms of the disease at 30.
Senator ⁷⁴	Germany	F	55	{ Fourth case in Germany. Began 2 years after menopause, which occurred at 45. No thyroid gland seen. A sister with similar symptoms.
Landau ⁷⁵	Germany	F	35	{ Amenorrhœa. Atrophy of uterus. Frequent attacks of facial erysipelas. Syphilis.
Rosenberg ⁷⁶	Germany	F	.....	{ Metrorrhagia. Removal of both ovaries.
Campana ⁷⁷	Italy	.....	.....	{ First case reported in Italy, in the <i>Italia Medica</i> .
Stewart ⁷⁸	Canada	M	41	{ Tetany of hand muscles preceding myxœdema.
Bouisson ⁷⁹	France	M	47	{ Obese. At 30 had right hemiplegia. Brain found parencephalic, as in idiots and cretins.
Shelswell ⁸⁰	England	.....	.....	{ Reports two cases with tendency to bleed, and collects several other cases with the same symptom.

* All these cases had the characteristic symptoms of myxœdema. Unusual features only are mentioned in the table, or such as refer to the etiology. † Reported by Dr. Ecklund, Stockholm, Corresponding Editor.

Cancer of the Thyroid.—One case, remarkable for the absence of pain and cachexia, is reported by Aigre;⁸¹ another by Augier,⁸² in a man who died of tuberculosis. A case of sarcoma is reported by Ransonhoff;⁸³ two cases of tuberculosis, one miliary, the other of caseous degeneration, resembling goitre, by Fränkel.⁸⁴

GRAVE'S DISEASE.

Pathogenesis.—The recent contributions to this subject are not conclusive. There is a concurrence of opinion as to the existence of some disturbance of the central nervous system. It is generally admitted that Brown-Séquard, Benedikt, and Fox were right in localizing this disturbance in the medulla oblongata and upper cervical cord. J. Mitchell Clark⁸⁵ observes that we have here in close relation the cardio-inhibitory, the vaso-motor and the glycogenic centres, all of which may be affected in Grave's disease. According to Dr. Clark, the disturbances are probably of the



CASE OF MYXEDEMA.

(From photograph kindly sent by Dr. Felix Semon, London.)

(*Fortschritte des Medicin.*)

molecular processes of nutrition, induced by changes in the metabolism of the thyroid gland. The case reported by him favors the theory of an original and general nutritive disturbance, in that the abdominal viscera were found to be of small size, and the thymus gland persistent. The theory of a central nervous disturbance is also advocated by Snell,⁸⁶ Durdufi,⁸⁷ and Jendrassik.⁸⁸ The latter observer believes that the disease is a poliomyelencephalitis, or inflammation of the gray substance, between the origins of the third and twelfth pairs of nerves. He reports the case of a child

six years old who had nuclear paralysis of the third, fourth, fifth and seventh pairs of cranial nerves, and who presented the symptoms of Grave's disease. The acceleration of the heart's action, and the eye symptoms were produced experimentally by Durduff⁸⁷ by punctures of the medulla. These observations are very interesting, and may lead to important results, but they are nothing more than explanations of the different symptoms. The starting point of the chain of phenomena remains unknown. P. G. Möbius⁸⁹ very ingeniously contrasts the symptoms of Grave's disease with those of myxœdema, and suggests that the former may be the result of an excitation, and the latter of an arrest of the functions of the thyroid gland. Weideman,⁹⁰ in his report on the results of extirpation of the thyroid, cites a case of goitre with symptoms of Grave's disease. The latter disappeared after the removal of the tumor. This is certainly not sufficient ground for the opinion that Grave's disease is simply the manifestation of mechanical disturbance of the sympathetic by tumor of the thyroid; because we may have Grave's disease without enlargement of the thyroid; and because that form of enlargement of the thyroid which is most apt to affect the neighboring structures, namely, cancer, is not followed by Grave's disease. C. C. Haase⁹¹ reports a case of supposed laceration of the carotid artery into the cavernous sinus, from a fall, followed in seven days by the appearance of the symptoms of Grave's disease. These were relieved by ligation of the common carotid. Exposure to cold and syphilis are mentioned as the causes in two cases of Bristowe's.⁹²

Morbid Anatomy.—Higgins⁹³ found thickening of the cervical sympathetic in one case, and Clark⁸⁵ reports the following results of a post-mortem examination: The emaciation was extreme. The exophthalmos had disappeared. The thyroid was large, firm and vascular. The heart was small, but the left ventricle was relatively hypertrophied. The thymus was large, but normal in appearance. The liver weighed only 28 oz. The pancreas was small. A microscopic examination of portions of the central nervous system and the sympathetic revealed nothing abnormal. The thyroid gland contained less connective tissue than normally. The epithelial elements were increased. There were evidences of rapid proliferation and decay of the latter. The extent of the colloid degeneration of the vesicles was less than normal. In a case of

Debreuilh,⁹⁴ the improvement of the symptoms of the disease was followed by the development of tuberculosis and multiple neuritis. Sclerotic changes were found in various regions of the cord.

Symptoms.—R. Norris Wolfenden⁹⁵ confirms the observation of Charcot to the effect that the body resistance to electric currents is lowered in Grave's disease. Whereas in health the average resistance is of 4-5000 ohms, it may be here reduced to 500. In a case reported by Vigouroux⁹⁶ there was paraplegia with some atrophy, but without recto-vesical trouble; in another there was atrophy, without paralysis, of the sterno-mastoid muscles.

The pigmentary changes in the skin receive special attention in the reports of cases by R. H. Lucy,⁹⁷ Drummond,⁹⁸ West.⁹⁹ Special mention of the eye symptoms is made by Katsaras,¹⁰⁰ Fitzgerald,⁹⁸ Snell,¹⁰¹ Möbius,¹⁰² West.⁹⁸ The peculiarities of the mental disturbances are described by Drummond,⁹⁷ Peterson,¹⁰³ Collins,¹⁰⁴ and others.¹⁰⁵ Intermittent albuminuria, oscillations of temperature, and enlargement of the tonsils are reported by Hutchinson,⁹⁸ West⁹⁸ and Peterson.¹⁰²

Treatment.—R. Vigouroux⁹⁶ gives directions for the use of the faradic current. One large electrode is applied to the lower part of the neck posteriorly. The other electrode, olive-shaped, corresponds to the negative pole. It is applied to the carotids, eyelids, brow, and upper branches of the facial. In so doing the motor point for protrusion of the eyeball should be avoided. This the author has found to be situated one centimetre behind and below the outer end of the eyebrow. A flat electrode is now used in place of the olive pointed, and is applied to the thyroid gland, and to the motor points of the sterno-thyroid and sterno-hyoid muscles. The positive pole should now be applied to the precordia for two or three minutes. On two occasions only has the faradization of the carotid given rise to unpleasant symptoms. Galvanism was very generally recommended at a meeting of the Detroit Academy of Medicine.¹⁰⁶ Cases successfully treated by electricity are reported by Hadden¹⁰⁷ and Nichols.¹⁰⁸ The latter observer attaches importance also to the treatment of uterine lesions. Drs. Hack, of Freiburg, and Chiari,¹⁰⁹ of Vienna, report that a decided improvement of the symptoms has followed the cauterization of the hypertrophied mucous membrane of the middle and inferior

turbinated bones. In two cases of Fritch,¹¹⁰ complicated with diabetes, the symptoms were relieved by dieting and the use of nitrate of uranium. Bristowe¹¹¹ reports a complete success from the removal of the isthmus by Sidney Jones. A partial extirpation performed by Lister was followed by immediate relief; but the subsequent history of the case, as given by Fraser, is not satisfactory.¹¹² The patient has been since subject to convulsions, and is now consumptive.

REFERENCES.

1. Berlin Klin. Woch. 2. Deut. Med. Woch. 3. Cent. f. Chir. 4. Deut. Med. Woch. 5. Cent. f. Klin. Med. 6. Lancet. 7. Berlin Klin. Woch. 8. Rep. of Dr. Angel Pulido, Madrid. 9. Berlin Klin. Woch. 10. La Semaine Méd. 11. l'Union Méd. 12. Med. and Surg. Rep. 13. Provincial Med. Jour. 14. Lancet. 15. Brit. Med. Jour. 16. Lancet. 17. Lancet. 18. Lancet. 19. Maryland Med. Jour. 20. Wien. Med. Woch. 21. Le Progrès Méd. 22. London Med. Rec. 23. Weekly Med. Review. 24. Goitre et Médication Interstitielle, Paris, 1886. 25. Le Progrès Méd. 26. Arch. de Méd. 27. Lancet. 28. Gaz. des Hôpitaux. 29. Lancet. 30. Med. Press. 31. Deut. Med. Woch. 32. Bull. d. l. Soc. Anat. 33. Le Progrès Méd. 34. Therapeutie Gaz. 35. Weekly Med. Review. 36. Indian Med. Gaz. 37. London Med. Rec. 38. Brit. Med. Jour. 39. Jour. de Laryng. 40. Pacific Rec. 41. Wien. Med. Woch. 42. Cent. f. Chir. 43. Deut. Med. Zeit. 44. Rep. of Dr. Bayer, of Prague. 45. Wien. Med. Blätter. 46. Deut. Med. Zeit. 47. La Semaine Méd. 48. Cent. f. Chir., 1886. 49. Revue Méd. d. l. Suisse Romande. 50. La Semaine Méd. 51. Deut. Med. Woch. 52. Deut. Med. Zeit. 53. Brit. Med. Jour. 54. Lancet. 55. Bull. d. l. Soc. Anat. 56. Deut. Med. Zeit. 57. Lyon Méd. 58. Med. and Surg. Rep. 59. Med. and Surg. Rep. 60. Provincial Med. Jour. 61. Lancet. 62. Ann. des mal. de l'Oreille. 63. Revue Méd. d. l. Suisse Romande. 64. Deut. Med. Woch. 65. Provincial Med. Jour. 66. Deut. Med. Woch. 67. Rep. of Dr. Ecklund, Sweden. 68. Berlin Klin. Woch. 69. Lancet. 70. Glasgow Med. Chir. Jour. 71. Cent. f. Chir. 72. Brit. Med. Jour. 73. Berlin Klin. Woch. 74. Deut. Med. Zeit. 75. Berlin. Klin. Woch. 76. Deut. Med. Zeit. 77. London Med. Rec. 78. Med. News. 79. Bull. d. l. Soc. Anat. 80. Lancet. 81. Revue Mens. de Laryng. 82. Jour. des Sci. Méd. 83. Cinn. Lancet-Clin. 84. Deut. Med. Woch. 85. Brit. Med. Jour. 86. Lancet. 87. Cent. f. Laryng. 88. Arch. f. Psychiatrie. 89. Deut. Med. Zeit. 90. Med. and Surg. Rep. 91. Deut. Med. Zeit. 92. Revue de Laryng. 93. Revue de Laryng. 94. Gaz. Heb. des Sci. Méd. Bordeaux. 95. Practitioner. 96. Le Progrès Méd. 97. Brit. Med. Jour. 98. Brit. Med. Jour. 99. Revue de Laryng. 100. Med. Rec. 101. Lancet. 102. Am. Jour. Med. Sci. 103. Med. Rec. 104. Lancet. 105. Gaz. des Hôpitaux. 106. Am. Lancet. 107. Lancet. 108. Jour. Am. Med. Assoc. 109. N. Y. Med. Jour. 110. Med. Press. 111. Revue de Laryng. 112. Edinburgh Med. Jour.

[Undated references apply to journals published in 1887, and original articles can be found by consulting the indexes of the respective publications.]

DISEASES OF THE LUNGS AND PLEURA.

BY JAMES T. WHITTAKER, M.D.,

CINCINNATI.

PHYSICAL EXPLORATION.

DR. J. R. LEAMING¹ contributes to the literature of this subject a paper entitled "Diagnostic Areas over the Human Chest," read at the annual meeting of the New York State Medical Association. The author first presents a brief review of the anatomy, internal and external, of the thorax, with especial reference to the acoustic properties of the various regions. He describes the human chest as an acoustic chamber mathematically adapted in its interior form for the reflection and consonation of sound waves originating in the larynx. He claims that the lungs fill the chest cavity with expansive force even after expiration, and press against the chest wall. With reference to the acoustic importance of the pulmonary vesicles, he says: "Each air-sac, distended with compressed air, is a resonator, and is in direct connection with the outer air during inspiration." The author evidently refers to the compression of the air due to partial closure of the glottis in phonation. The natural respiratory murmur is composed of the vibrations in the convective air-tubes, the friction sound of the tidal air, and the susurrus of the muscles covering the sacs themselves, consonated in the air-cells and transmitted to the ear through the chest-wall. The importance of the "multitudinous resonance and sound-conduction" of the lungs to the power, compass and infinite modulation of the human voice, is not omitted. "Those who listen with delight to the music of the voice of a great singer like Patti must stand in awe at the divine mechanism." . . . Wonder is also expressed that this nicety of mechanism can be so long preserved in persons exposed to all the vicissitudes of climate and the nervous depression incident to a life of anxiety and worry.

The following statement will doubtless strike some of our readers as extreme, and it certainly indicates extreme shrewdness on the part of the diagnostician: "We are told that autopsies frequently reveal organized adhesions of the lungs to the chest wall, or of the lobes to each other, or to the pericardial sac, which had not been suspected during life, but each attachment is an opening for sound leakage, both of the voice and respiratory murmurs, and constitutes a diagnostic area which should have been discovered by the careful auscultator." Such acumen can hardly be expected of the general practitioner, however careful. Without questioning the truth of the author's statement, we are reminded by it of the nomadic auscultator of our Western frontier, with hearing so acute as to be able to recognize the sound of the growing grass.

Auscultation, however, is not physical diagnosis, and we are reminded of certain conditions which are apt to be misleading. The attachments of the pleura to the chest wall are likely to so greatly exaggerate the pulmonary sounds as to lead to the supposition of pathological conditions in the lung. Still more misleading are the signs where adhesions bind together the chest wall and a portion of the lung which has undergone fibroid induration, extending down to a dilated bronchus. The area over the adhesion is depressed and there may be a cracked-pot percussion note, with cavernous respiration. The spoken and whispered voice tests seem to corroborate the evidence of the existence of a cavity, the cough test alone disfavoring that conclusion. Yet there may have never been a cavity in the sense of an excavation of pulmonary tissue; nothing further than that of bronchiectasis. The sounds are always conducted with much greater distinctness through solidified lung tissue. Our author avers that this condition is much more frequently a cause of error in diagnosis than is generally supposed. Two such cases are cited. One, a physician, had an area of depression over the right bronchus, with all the physical signs of a cavity except that of the cough test. Dying of another affection, the autopsy revealed only shriveled fibroid lung, but no cavity. The other had been subject during the greater part of his life to hæmorrhages, but lived to be 95 years old. A fibroid lung was found post-mortem, which was erroneously pronounced a cicatricial growth. These diagnostic areas, which

are so subject to erroneous interpretation, occur only over large bronchi, particularly in the right infraclavicular region.

Dr. Leaning points out another important cause of error due also to pleuritic adhesions; the local manifestations of which are found in the left infraclavicular region. The most important results are hoarseness and altered tones of voice owing to involvement of the recurrent laryngeal nerve. Various other errors are possible. Percussion over a circumscribed pleuritic effusion, filling the sac to its utmost tension, is liable to yield a tympanitic note, owing to the transmission of the vibrations through to the distended colon beneath. Tumors, concretions and cavities in the centre of an otherwise healthy lung are difficult of detection. The pulmonary apices and the region about the apex of the heart are localities especially liable to yield doubtful physical signs.

TRACHEO-BRONCHITIS.

M. J. Simon² reports the case of a child two years old, which had for two months suffered from a tracheo-bronchial wheezing, with a cough supposed by the parents to be that of whooping-cough. Examination of the child showed that the respiration was accelerated (over 60 per minute), with a distinctly audible wheezing. There was no evidence of tumor in the throat, nor of abscess, nor yet of enlargement of the tonsils. The diagnosis was tracheo-bronchitis with enlargement of the bronchial lymphatics. With reference to the last factor, the author remarks that bronchial adenopathy is not an infrequent accompaniment of affections of the larynx, trachea and larger bronchi of infants, particularly of those under one year of age.

Etiology.—The cause of this trouble is most frequently a general lack of care in the children of the poor, or of improper hygiene, which is liable to occur in all classes of society.

Symptoms.—The affection is characterized by a laryngeal or tracheal voice, an imperious, incessant cough, simulating that of pertussis. Auscultation does not reveal any characteristic râle, and it is often with difficulty that the affection can be located in the trachea or larger bronchi. Fever is often present in the earlier part of the disease, but disappears after a few days. The cough, however, persists indefinitely, occurring in paroxysms accompanied by wheezing; sometimes it becomes chronic. During

this period percussion and auscultation reveal nothing abnormal in the chest further than a slight roughness of the respiratory murmur. The congestion extends not only to the bronchial glands, but, in greater or less degree, also to the air-cells. Hence the dyspnoea which is present.

Treatment.—The treatment recommended by M. Simon in these cases is by slow revulsion to the chest, in front and behind, either by painting with tincture of iodine, or by means of some kind of irritant papers or plasters, rarely by means of the application of croton oil. If the infant is still at the breast, the mother may be given the iodide of potassium, in order to act upon the child through the milk. The prognosis is always grave in these cases, but much depends upon the hygienic care which the little patient receives.

CHRONIC BRONCHITIS.

Etiology.—G. Nosovitch³ concludes from the examination of 738 soldiers of the Nevsky Regiment, 235 of whom had bronchitis (31.8 per cent.), that the posture of the body in sleep may have some influence on the production of the disease, or more properly in determining what part of the bronchial tree shall be attacked. His statistics do not, however, warrant the adoption of his conclusions, as his comparisons are not made upon the same basis of calculation.

H. A. Latimer⁴ describes the production of bronchitis, along with other disease of the lungs, from working in copper. The disease seems to be produced by the inhalation of vaporized arsenic, and other metals, with certain earthy matters, and in part, perhaps, by dust, which is generally abundant in the atmosphere of the locality. DaCosta⁵ reports a case produced by the fumes of nitric acid. The expectoration was so foetid as to suggest gangrene of the lungs.

Various mechanical irritants, producing at first the acute bronchitis, by their continued presence cause the development of the chronic form. T. C. Smith,⁶ of Aurora, Indiana, reports a case in which the irritant was a fragment of hazelnut shell which had been drawn into the trachea of a child and was expectorated after a month. He refers also to a case previously reported by the late Dr. A. T. Keyt, of Cincinnati, in which a splinter of hard wood was the cause of the disease.

Symptoms.—Thomas R. Fraser,⁷ of Edinburgh, calls attention to the fact that dyspnœa, even resembling that of asthma, is often an important symptom of bronchitis. It depends, according to this author, upon defective aëration of the blood, caused either by insufficient contact of air with blood-vessels in the pulmonary vesicles, or by insufficient movement of air in the air-passages. The same author, in speaking of the action of the nitrites on the dyspnœa of bronchitis and asthma, calls attention to the fact that whenever rhonchi and sibilations accompanying dyspnœa are removed by the administration of the nitrites, the dyspnœa is also removed or lessened. But the nitrites do not always afford complete relief of the dyspnœa and complete removal of the auscultatory phenomena. The dyspnœa of bronchitis is sometimes produced by the accumulation of mucous or other inflammatory products in the bronchial tubes, and rhonchi are sometimes caused by the viscid condition of these accumulations, or even by a similar accumulation in the throat. In these cases the administration of the nitrites fails to give complete relief, or even to silence the abnormal sounds. This fact the author believes is a confirmation, rather than a refutation of the view that stenosis of the bronchi due to spasmodic contraction of the muscles of the bronchial walls is a frequent cause of the dyspnœa of ordinary bronchitis.

Treatment.—Dr. B. W. Palmer⁸ has well remarked that one cannot review the treatment recommended for the different varieties and stages of bronchitis without being impressed with the number of remedies suggested. He adds that we have as yet no specific method of treatment; but every physician has his own favorite compound of expectorants, demulcents, sedatives or stimulants. Many of these are doubtless good; but many are unreliable from a therapeutic point of view, or pharmacally inelegant, unpalatable and even nauseating. The remedy or combination of remedies employed should be modified to meet the phase or state of the disease presented, or the individual idiosyncrasies of the patient.

Dr. Thos. R. Fraser,⁷ in a clinical lecture delivered at the Edinburgh Royal Infirmary, maintains the efficacy of the old treatment by the nitrites in the dyspnœa which sometimes develops in bronchitis. Although not aware of facts justifying the preference of any one of the nitrites, he prefers that of sodium and nitro-

glycerine. Two patients were presented in illustration of the action of the nitrites in dyspnœa. One had been in the wards of the hospital for several weeks. He had suffered at intervals during the last fifteen years from bronchitis. His lungs were emphysematous, and when presented, his chief complaint was of breathlessness and cough, with a rather adhesive and slightly frothy sputum of small quantity. The other patient had had a bronchitis of four months' standing, very obvious dyspnœa, with a copious, watery and frothy sputum. Auscultation demonstrated the presence of snoring, whistling and cooing râles. To test the action of the nitrites, the lecturer now ordered the administration to one of these patients of four drops of the nitrite of amyl, to the other, two drops of the 1 per cent. solution of nitro-glycerine. After a few minutes, the respiration had become silent, and the dyspnœa was entirely subdued.

The author's preference for the nitrite of sodium and nitro-glycerine is based upon the ease with which they can be administered in solution, by the stomach or hypodermically, as well as upon the fact that they are vastly more stable than the nitrites of amyl and ethyl. He thinks it probable, however, that much of the favor possessed by the spiritus ætheris nitrosi is due not only to the action on the circulation which it shares with other nitrites, but also to its previously unrecognized action on dyspnœa in bronchitis.

Local Treatment.—This subject has been ably presented by Dr. Benjamin F. Westbrook.⁹ He practiced three methods of treatment: (1) by the introduction of a coarse spray into the air-passages by means of Sass' spray apparatus; (2) by the inhaling apparatus of Dr. Geo. A. Evans; and (3) by the pneumatic cabinet. The principal indications watched for in the use of the direct method were the amount and violence of the cough, the amount and character of the expectoration, and the presence or absence of emphysema or asthma. Carbolic acid or extract of hyoscyamus were used to allay cough. The following formula was employed:—

R	Acid. carbol. cryst.,	.	.	.	.	.	.	℥xx
	Sodii bibor.,	.	.	.	.	.	.	ʒiij
	Sodii phosph.,	.	.	.	.	.	.	ʒij
	Glycerini,	.	.	.	.	.	.	ʒj
	Aquæ,	.	.	.	.	.	.	ʒvj.—M.

The nasal passages were first cleansed by means of the spray and the patient directed to draw out the tongue while the spray was thrown into the pharynx or directly into the larynx. The strength of the solution was then increased by the gradual addition of a 50 per cent. solution of carbolic acid in glycerine until the point of tolerance was reached. The inhalation was repeated five or six times. The treatment was applied every day or every other day. No home treatment was used, other than tonics or alteratives. This treatment is not always effective. It is sometimes necessary to rely upon sedative drugs, particularly at first and where the spasmodic character is well marked. If the carbolic acid treatment fails, the fluid extract of hyoseyamus may be added or substituted. It may be used after cleansing with the carbolized alkaline solution, in the proportion of a drachm to the ounce. Astringents may be employed when there is a copious secretion of mucus. The most efficacious of these are tannic acid, the iron salts and the fluid extract of pinus canadensis. The standard solution of tannic acid is—

R	Acidi carbolicæ cryst.,	.	.	.	.	.	.	℥xv
	Glyceriti tan.,	.	.	.	.	.	.	℥ijss
	Aquæ menth. pip.,	.	.	.	.	.	.	℥vss.—M.

When the patient has become accustomed to the inhalation of this solution, the glycerite of tannin is added until the solution becomes as thick as can be forced through the apparatus with a pressure of forty or fifty pounds. Of the iron salts the author prefers the chloride, an equal mixture of the tincture of chloride and glycerine, diluted to about one-fourth and used in the manner just described. The preparation of pinus canadensis preferred is Kennedy's white fluid extract with an equal part of glycerine.

The advantages claimed for this method of treatment over those to be described are that it occupies less time—since a far greater amount of fluid can be introduced by it in the same length of time—and its greater cleansing power. One cause of avowed failure on the part of certain gentlemen who have recently written on this subject, the author thinks is to be found in the low pressure which they use in the introduction of spray into the nostrils. The amount of pressure required is to be determined by the amount of resistance which it encounters in passing through the nostril and by the sensations of the patient. In the spraying of

the larynx and trachea it is always best to use a very high pressure, (1) because a large amount of fluid is introduced in a short space of time; (2) because the forcible impact against the walls of the mouth and pharynx nebulizes it to such an extent that it is more widely diffused; and (3) because there is less liability of permitting a drop of the fluid to collect on the end of the tube and fall into the trachea,—an accident which is most distressing to the patient.

The author has also met with some success in the treatment of chronic bronchitis with the pneumatic cabinet. The solutions inhaled were a 20 per cent. solution of carbolic acid with borax and glycerine, a solution of fluid extract of pine needles with iodine, and a combination or mixture of the two solutions in equal parts. Individual cases of course demand a modification of this treatment; for instance, the solution of hyoscyamus may be employed in the treatment of asthmatics. The cabinet is not indicated in the treatment of emphysema. The author has seen one case of violent asthma produced by the cabinet. The inhalation of hyoscyamus may be accomplished as well outside of the cabinet as in it. The cabinet is particularly valuable in very chronic cases where the relaxed vessels of the bronchial mucous membrane, though for a time contracted by the action of stimulant applications, soon resume their previous dilatation. The action of the cabinet is twofold: (1) As has been pointed out by Dr. Isaac Hull Platt,¹⁰ by the compression of the bronchial surfaces, and by some alterative effect, due probably to a combination of the compression with the tonic action upon the vaso-motor system of the lungs. (2) By the action of the spray introduced during treatment. The disadvantage is that the cleansing effect of the spray is lost. To obviate this, Dr. Westbrook is in the habit of accomplishing this part of the treatment with the Sass' apparatus before placing his patient in the cabinet. The apparatus introduced by Dr. George A. Evans has been too long before the profession to render a description of it necessary. The advantages claimed for it are: (1) That the patient is compelled to make voluntary efforts at deep inspiration during a considerable length of time, thus putting into operation a valuable system of pulmonary gymnastics. (2) The spray, very finely nebulized and introduced directly into the respiratory passages, has the best possible

opportunity of diffusing itself in the residual air of the pulmonary vesicles. (3) Much stronger solutions can thus be used than could be tolerated by any other method of introduction. Although immense volumes of spray are introduced by this apparatus, the quantity of fluid which is vaporized is comparatively small, and not enough to produce toxic symptoms. The objection to the method is that as the spray is introduced by no other force than the inspiratory efforts of the patient, it has no cleansing power. This, however, may be obviated, as in the case of the cabinet, by means of Sass' apparatus, used just previous to the inhalations with the Evans' method.

To obtain satisfactory results with this apparatus it is necessary to employ a high pressure of air, preferably from sixty to eighty pounds. By this means a great volume of spray is produced. Where the mucous membranes are very irritable and the strong solution of carbolic acid is not well borne, a mixture of the fluid extract of pine needles with iodine is very serviceable. This, too, may be combined with an equal quantity of a 15 per cent. solution of carbolic acid. Solutions of tannin cannot well be used in this apparatus because of their exceedingly disagreeable taste.

PLASTIC OR PSEUDO-MEMBRANOUS BRONCHITIS, FIBRINOUS BRONCHITIS, BRONCHIAL CROUP.

The contributions to the literature of this subject for the past year were introduced by Dr. H. A. Johnson,¹¹ in a paper read before the Chicago Medical Society, and discussed at some length. The author looks upon the disease as one of great rarity, if we exclude the persistence of a diphtheritic bronchitis and croupous pneumonia, in both of which diseases the expulsion of a false membrane may occur. The literature of the subject is quite voluminous, as is shown by the records in the index catalogue of the Surgeon-General's office; but the number of cases is small. The author reviews the literature of the disease as far as known to him. Eichhorst, he adds, has been able to find only 100 cases of the disease reported.

Etiology.—Cheyne thinks old age predisposes to the disease. Valleix doubts it. Gintrac says the larger number of cases are observed in adults. Rgel, cited by Dr. M. J. Madigan,¹² in an article based upon that of Dr. Johnson, says that it is especially

infrequent between the ages of one and ten years. The affection is more common in the male than in the female sex. This is denied, according to Dr. Robert Babcock,¹³ by Dr. Douglas Powell, who has seen it more frequently in females, and at all ages. Enfeebled health from previous disease, poverty, fatigue, exposure, are usually given as predisposing causes. The cause, however, remains to be discovered. Dr. Johnson thinks it may be some colony of parasites. This is suggested by the relation of the disease to the ordinary forms of membranous inflammation in which bacteria are believed to be a pathogenic factor. No constant relation to antecedent disease can be claimed for the affection, since it is rare that it follows either simple bronchitis, diphtheria or pneumonia. Rgel says, "a special predisposition, or the influence of some special unknown agency is always essential, in addition to the hypothetical causes enumerated." Dr. Madigan infers that the disease generally occurs in individuals having an inherited or acquired dyscrasia, and cites a paper of Dr. Engelmann,¹⁴ who regards the disease as the local expression of a constitutional condition rather than a disease *sui generis*.

Pathology.—The chief factor in the production of this affection is the formation of a coagulating exudation on the surface of the mucous membrane. Not infrequently the exudation is deposited in successive layers, giving the formation a stratified character. Leucocytes are found in the meshes of the coagulum. The mucous membrane proper is not involved in the process, but continues to produce its surface epithelium, and it is chiefly due to the proliferation of this epithelium that the exudation is finally detached from the mucous membrane. Although the latter does not take part in the necrotic process which is going on in the exudation covering its surface, it is nevertheless the seat of morbid action. Dr. Johnson compares it to the change which takes place in the intima of blood-vessels leading to the formation of thrombus. In the latter instance, however, the process need be of the most superficial nature, since the deposit takes place from fluid circulating in the interior of the vessel and constantly in contact with the diseased part. In the bronchial affection, on the other hand, the elements composing the exudation must come from the vessels underlying the epithelium. The membrane has been examined by M. Pennetier, and found to be composed

of the same characteristics as the croupous membrane, without a vestige of epithelium.

Symptoms.—It appears to be a generally accepted fact that pseudo-membranous bronchitis is more frequently a chronic than an acute disease. Dr. N. S. Davis¹⁵ reports two acute cases, considering them rare. The cases of the acute form which have been met with, attacking a great part of the mucous membrane of the bronchial tree, have been almost uniformly fatal. The first of these seen by the speaker was that of a servant girl attacked with a general bronchitis. She had probably a specific history. At first the disease resembled an ordinary acute bronchitis. During the first two days there was little expectoration, then a little viscid mucus during the paroxysms of cough, and several times a day there came with it well-defined shreds of a membranous character, sometimes an inch and a half long. Later the membranous expectoration ceased and there was a profuse purulent secretion, resembling that of tuberculosis. There were no cavities in the lungs. The case terminated fatally. The other acute case was that of a child between seven and ten years of age.

A case of sudden death which was probably the result of the acute form of this disease is reported.¹⁶ A woman of 29 died suddenly in the street. She had had for only a day previously a slight redness of the tonsils. The post-mortem examination showed the trachea and bronchi filled with a thick tubular membrane. Sudden death had occurred from stoppage of the bronchi.

In the case reported by Dr. H. A. Johnson, the patient, æt. 37, had a good family history and a very indefinite history of syphilis, but had for several years, ending at his 25th year, been a sailor, and was for several years a saloon-keeper. Eight years before he had pneumonia of the right lung lasting six weeks. His health was then good until March, 1884, when he "caught cold." Was not aware of having expectorated any membrane, but his cough never entirely ceased until the present disease developed. When first seen his temperature was 99.3° F., respiration 17, pulse 75. Inspection revealed a flattened chest, the two sides corresponding, however. Percussion revealed dullness over right side; left side normal. Right vocal fremitus exaggerated. Also, bronchial respiration over upper portion of the right side, front and back. Left side normal, cardiac sounds normal. 24

days after this examination the patient expectorated a cast of the right large bronchus. This was followed by a rather persistent hæmorrhage. Physical examination showed that the dullness over the right side had disappeared. Two weeks later another cast was coughed up, followed by a pus streaked with blood. For some time after this casts were expectorated almost daily. The patient finally made a tedious recovery.

The liability of the disease to recur even after years of more or less immunity from bronchial trouble, is well exemplified in a case reported by M. Charboux.¹⁷ The patient, Mme. X., æt. 26, after a severe cold in 1879, suffered greatly from attacks of dyspnoea with cardiac palpitations, upon the least exertion. In August, 1881, while aboard ship, being pregnant for the second time, and while her little daughter was suffering from an attack of whooping cough, she was seized with extreme dyspnoea almost to suffocation, when a large false membrane, ramified like the branches of a tree, was expectorated. The membranous expectoration continued eight days, when the difficulty subsided. The pregnancy terminated in January, 1882. The day following, pseudo-membranous bronchitis developed, the attack lasting 15 days. The years 1882 and 1883 were passed without the occurrence of the disease. In January, 1884, the affection again developed and continued three months. In January, 1885, the patient suffered from left-sided pneumonia, which ran its course, however, without the occurrence of membranous expectoration. During 1885 and 1886, the disease made its appearance at long intervals. At the time the author made his report, the patient was suffering from an attack similar to those to which she had so frequently been subjected.

Treatment.—No well-defined plan of treatment has been proposed for this malady. Dr. Johnson at first prescribed for his patient tonics, syrup hypophosphites and hydrobromic acid. He was soon compelled, however, to administer the fluid extract of ergot on account of the hæmorrhage which followed the detachment of the false membrane. For the purpose of increasing the plasticity of the membrane, he added to the ergot, balsam of copaiba and the oleoresin of cubebs. The iodide of potassium was given a trial, and protiodide of mercury, the tonic treatment being at the same time continued. Under this treatment the character of the expectoration was improved. The liq. ferri iod. was

later substituted for the potash salt. The patient improved slowly. Finally an emulsion of turpentine was prescribed with apparent good result. The further treatment of the case falling into the hands of Dr. S. D. Jacobson, antiseptic methods were adopted, and arsenic, iodine, bichloride of mercury and iodoform were administered.

Dr. N. S. Davis found that the chronic form was benefited most by ordinary anodyne expectorants combined with alteratives, especially of the mercurial class. In two cases the steady use of the alterative mercurial until there was slight swelling of the gum and a taint of the breath, succeeded at this juncture by the oxide of potassium with a more tonic class of expectorants, was followed by good results and ultimate recovery. The same authority refers to the case of a man who stated that he had expectorated long shreds of membrane, but did not preserve any of them for inspection. There was a well-marked rheumatic diathesis in the case, and for this reason the salicylate of sodium was prescribed, in 10 to 15 grain doses, accompanied by ordinary anodyne expectorants. The result was favorable. Not only the bronchitis, but also the rheumatic troubles disappeared, and the patient made a good recovery. As the salicylates rank among the most available of the antiseptic remedies, their administration would be highly proper, even in the absence of a rheumatic diathesis, or of indications of a rheumatic type of bronchial disease.

PNEUMONIA.

Etiology.—Bruce,¹⁸ of Dingwall, detailed the symptoms of 23 cases, coming under his care during the months of May, June, July, August and September, 1883. Dr. John Adam,¹⁹ also of Dingwall, cites 24 cases occurring during the same year. While 7 occurred during the first four months, as many as 15 occurred during the next four, and only 2 during the remaining four months of the year. The author described three kinds of cases: (1) Typical uncomplicated cases of pneumonia. (2) Uncomplicated cases of influenza or catarrhal fever. (3) Cases of pneumonia, preceded or accompanied by influenza or catarrhal fever. Were there, then, two distinct epidemic diseases occurring in the same district or even in the same individual simultaneously and independently; or did one occur as a complication or sequela of the other? That

the outbreak of pneumonia had arisen from some pathogenic agency or organism, usually inoperative or absent, is proven by the fact that the neighborhood has heretofore been exempt from such epidemics. Of the two diseases the catarrhal fever was much the more prevalent and followed here and there by pneumonia. The cases of pneumonia occurred at wide distances, and there was no evidence of the disease having been communicated.

Dr. R. J. Foulis reported the prevalence of pneumonia of an epidemic character in the following districts: Wylain, 40 cases; Horsly, 29; Heddon-on-the-Wall, 31; Houghton, 4; Blue Bell, 11; hence 115 cases, all within a radius of two miles from Wylain. The epidemic continued from Nov. 6, 1886, until the beginning of January, 1887. The pneumonia was of the ordinary croupous variety of a decidedly infectious type, and on an average terminated by crisis on the seventh day. Only 2 proved fatal. The editor of the *British Medical Journal* in commenting upon these epidemics says, that from the results of practice—in other words, of experience—it has long been known (1) that pneumonia is liable to occur in series and to prevail at certain seasons; (2) that it is sometimes so prevalent in localized areas as to justify the term epidemic; (3) that it appears to be occasionally contagious. Several epidemics occurring in Germany and those above quoted unquestionably favor the possibility of a microbic origin of the disease. It seems not unlikely that such observations may have indirectly given birth to the work of Friedländer and others which has led to the discovery of the pneumococcus. Epidemic influence is very difficult to analyze as it embraces so many intangible possibilities. Contagion is far less so, because there is no gainsaying the clinical fact that pneumonia is certainly not contagious. It seems that the position held by Dr. Sturgis, that pneumonia may arise from a plurality of causes, is that which, with our present light, most commends itself to a sober judgment.

Dr. A. E. Bell,²⁰ in a paper read before the Muskingum Valley District Medical Society, reports 14 cases of pneumonia occurring in four families, living within the limits of one mile in a healthy neighborhood in the country. Again, Dr. J. E. Graham²¹ describes a series of cases of pneumonia which he has recently observed. He shows the following conclusions: (1) That lobar pneumonia is in almost all cases an essential fever. (2) That it is a parasitic

disease. (3) That it frequently occurs in the form of epidemics. (4) That it occasionally has appeared to be contagious. (5) That the disease, in an epidemic or contagious form, is nearly allied to erysipelas.

Jaccoud²² makes two cases of acute pneumonia reported to the Academy of Sciences his text in discussing the bacterial origin of the disease. He disputes the proposition that the pneumococci are alone its sole cause. While not denying their etiological connection, he holds that exposure to cold is also causative, the connection between the cold and the symptoms following being too obvious to be overlooked. It is not probable, that although the bacteria did not gain entrance to the body at the precise moment of the chill, they were previously present in the air passages, profound circulatory or other change bringing them into activity. This exciting change he finds in the exposure to cold. In general he urges that the bacterial causes should not supplant, but rather supplement, the etiological factors already known.

Dr. A. Koch²³ reports the case of a man aged 38, who fell from a great height and sustained a severe contusion of the left thorax. Two days later he was taken ill and had a severe pain in the chest. He went to the hospital, where he died two hours after admission. The post-mortem showed croupous pneumonia with red hepatization. The lung swarmed with the bacilli of pneumonia. The ribs were not injured. The patient was entirely free from disease at the time of the accident.

M. Perret,²⁴ in conjunction with M. Rodet, has made a series of experiments to produce pneumonia in animals by injection of microbes, and concludes from the results obtained that pneumonia may be produced by a variety of microbes, and that the germs of such specific diseases as typhoid fever, measles, scarlatina, etc., are among the number. Weichselbaum²⁵ states that the bacteria found in the different forms of pneumonia are to be regarded as the cause of the inflammation, as well characterized species of bacteria not only occur constantly, but can be demonstrated in great abundance, and when cultivated and introduced into different animals, produce a disease similar to the inflammation of the lung in man. The diplococcus of pneumonia is to be regarded as the most frequent cause of inflammation. Weichselbaum considers "catching cold" only a predisposing event in pneumonia.

Dr. Henry Baker,¹ of Lansing, Michigan, in a paper read before the Brooklyn Pathological Society on "The Causation of Pneumonia," presented statistics of over 30,000 weekly reports of sickness and 150,000 observations of the atmospheric temperatures. He demonstrated by diagrams that the temperature curve was pretty regularly followed by the curve representing sickness. His observations extended over quite a number of years, and included the statistics kept during the late war, representing nearly 50,000 cases of pneumonia, as well as the statistics of the 114,000 deaths from pneumonia during thirty years in London. In all of the references the author showed that the sickness curve follows the temperature curve, not only in pneumonia but also in bronchitis. If pneumonia were due to bacteriological influence, this cause must certainly be influenced by the weather, more than that bronchitis would probably be caused by the same germ. The temperature and humidity of human lungs is nearly always alike. Air inhaled cold, and consequently dry, is soon returned from the lungs warm and nearly saturated with water at that temperature. Sudden change of temperature originates a congestion amounting almost to stagnation. When the air is cold and dry, a large amount of vapor is being taken from the air passages, leaving the non-volatile chlorides to collect in the air cells. This condition is said to favor exudation of plastic material into the air cells,—the most important phenomena in pneumonia. The author inquires whether diet may not be a predisposing cause, since in the extremely cold countries where there is but little salt consumed, pneumonia is rare; while in the warm countries where a great deal of salt is required to preserve food, pneumonia is more frequent. Dr. Seibert,²⁶ in replying to the arguments advanced by Baker, says that the latter errs in not differentiating between catarrhal and fibrinous pneumonia, and in basing his conclusions on a comparison of monthly averages of health reports from different parts of a State so large that there is of necessity a variation in the meteorological conditions.

Sevestre⁶ describes a form of infectious broncho-pneumonia observed as an endemic and sometimes as an epidemic among children during the summer months,—the cause of which he believes to be dietary indiscretion. The involvement of the lung may be attributed to an extension of the poison to the lung from the

intestines through the lymph channel. Dr. W. W. Taylor,¹ of Memphis, Tenn., describes a form of pneumonia and malaria prevalent in his region. The patient suddenly has a chill, followed by fever, with pain in the side, free expectoration of blood and abundant crepitant râles. In a few hours the fever subsides, and there is improvement in both local and constitutional symptoms. Without proper treatment, another paroxysm will occur in 24 or 48 hours, and the patient will die in the third or fourth attack. Dr. Taylor also calls attention to malaria as a predisposing cause of pneumonia, and an underlying factor in the disease as met with in his section of the country.

Dr. Tomasi,²⁷ at the Twelfth Italian Congress, raised the question whether pneumonia is always to be attributed to the same cause. He recognizes its epidemic character and has often found it to be contagious; but still, however, he cannot doubt the occurrence of pneumonia due to moist cold, or the intermittent pneumonia due to malarial infection. Golgi declared that his experience did not confirm the existence of malarial pneumonia. Bozzolo believed that all primitive pneumonias are caused by the diplococcus of Fränkel. Maragliano subscribed to this view, but said that in his estimation many of the so-called malarial pneumonias are simple pneumonias presenting some malarial symptoms.

Symptomatology.—A number of cases presenting unusual symptoms have been recorded during the year. Dr. Noyes²⁸ reports a case in which all the subjective symptoms pointed to a well-defined attack of pneumonia, with the exception of cough and expectoration, which was absent from the beginning to the end. The temperature ranged from 100° to 103°. After an illness of five weeks, the patient convalesced rapidly. Dr. Diller⁶ had a patient, aged 35, in whom gangrene of the lung complicated croupous pneumonia, the symptoms being pain in the left chest, impaired resonance from fourth rib down, râles and some blowing breathing over this area. The man's breath became so fetid that he had to be removed from the hospital ward to a room by himself. At the autopsy, the right upper lobe was found to contain a cavity about the size of an orange, filled with a horribly offensive fluid. The left lung showed some hypostatic congestion at its base. Otherwise it was in a normal condition. The right lung

had all the appearances of beginning gangrene,—a condition not frequently following pneumonia.

In patients addicted to the use of alcohol, pneumonia runs a somewhat altered course in some cases. Dr. Haw⁴ reports a case in many respects a typical pneumonia, but presenting the peculiarity of involving the right apex. There were three distinct rigors on successive days, instead of one, as usual in all cases except those of children and old people, in whom it is frequently absent. With the appearance of the lung lesion, the patient showed some mental symptoms,—delirium, which lasted until after the crisis.

In a lecture at the Pennsylvania Hospital, Dr. Longstreth²⁹ presented a specimen of lung tissue, showing what he termed “irregular pneumonia.” When admitted to hospital the patient complained of cough and dyspnoea. The following night, fever, with pain in the right side of the chest, caused much uneasiness. An examination of the urine showed granular and hyaline casts and some albumin. Mucus and blood were expectorated. At the autopsy, a few days later, a small amount of serum was found in the right side and old adhesions between the pleural surfaces on the left side. The lung had the appearance of gray hepatization. The patient when admitted evidently had bronchial trouble, and later the solidification came on; or, in other words, there was first a catarrhal condition and afterward an exudation of blood and fibrin. At the apex, where solidification was greatest, it was not complete. The kidneys gave evidence of inflammation, whether due to the same cause as the pneumonia it is difficult to say. Many of these cases of irregular pneumonia are fatal. They are always difficult to diagnose, since so many symptoms are marked.

At a meeting of the Fribourg Medical Society, Prof. Favre²⁷ reported a case of inflammation of the upper lobe of the right lung, complicated with hemiplegia and suppression of the radial pulse of the right side. He concluded that the complication had been produced by an embolus. No cardiac symptoms were evident, and he was led to believe that the embolus originated from coagulation in the pulmonary veins. Dr. Thurber had the opportunity of observing a case of pneumonia complicated with suppression of the pulse, showing a certain analogy to Favre’s case, except that the symptoms were more pronounced.

Prognosis.—Dr. W. D. Schuyler¹ classes the disease among the limited affections. It is of comparatively brief duration, and in its essential action and normally considered, is not a dangerous malady, but tends to recovery, and hence cannot be considered dangerous in itself. When its course is influenced by extraneous, concurrent, idiopathic or complicating conditions, it tends to the occurrence of grave, but often therapeutically preventable, dangers that render it a most fatal malady. The author refers to the seeming anomaly of being considered both a harmless disease, from which death results exceptionally, and also a most dangerous affection, from which death results in a large percentage of all the cases. He holds that (1) such varying results are clearly explicable upon the theory that acute pneumonia is simply a functional and dynamic malady (from disturbance of circulatory equilibrium and its results); the natural outcome of such a dynamic action occurring in the organs involved in subjects of the various asthenic—idiopathic, concurrent or complicating—states in which the disease is most likely to occur, especially when its course is not directed and controlled by a properly indicated treatment; and (2) that a careful analysis of prognostic conditions will sustain such position. As generally held, a more unfavorable prognosis of acute lobar pneumonia depends mainly upon the conditions,—a greater extent of the local process; an apex development a greater intensity of fever; advanced age of the patient; the female sex; previous bad habits of life; a debilitated constitution and, in a very important sense, the occurrence of complications. The author cites the following authorities as representing the teaching of the first point, *i.e.*, the extent of lung involved:—Jürgensen, Niemeyer, Watson, Loomis and Aitken, the latter declaring that the degree and extent of the physical signs alone should not influence the prognosis.

Contrary to the general teachings, Dr. Schuyler holds that the evidence afforded does not show that the results of a pneumonic attack are necessarily less favorable when there develops a more extensive local process, and he does so on the ground that the local process is not essentially an inflammation. For the latter statement he offers the following evidence: as a process, on the whole, it is unlike any of the well-accepted inflammations,—as to its causation, mode of development, rapidity of complete formation,

anatomical characters, character of events, limitation and negative morbid results. Its causation is involved in doubt and obscurity, while causes of inflammatory processes generally are readily traced. Its occurrence does not coincide with that of inflammations in general, and especially not with either of the undoubted inflammations to which it is most nearly allied anatomically, bronchitis or pleurisy, which affections occupy in part the same structures it involves. Acute pneumonia occurs less frequently than those affections do in the farther North, and much more frequently than they do in tropical regions. It is unlike these diseases in its recurrence, varying from year to year. Again, it is not set up by these inflammations, although, as stated, they implicate in part the same structures, and it is especially unlike an inflammatory process, in that it is not excited by extrinsic irritating agencies, nor set up by contiguous inflammations, and is not excited by contiguous gangrene, emphysema or pulmonary infarction, and lastly in not being developed from traumatism. In its general anatomical events it is unlike an inflammatory process in the character of the congestion which, instead of being eminently active, as should be expected, is strictly passive. It is unlike an inflammatory congestion in the character of the blood involved, which is venous, but not arterial. Venous blood is deoxidized, charged with carbonic acid, and hence chemically incapable of generating or maintaining an inflammatory action. The exudate is, as a rule, hæmorrhagic, while in an inflammatory action, a hæmorrhagic exudation is the exception; it differs also in that it consists of preformed non-pyogenic products; in the rapidity and extent of its formation and in its occurrence without causing some degree of anatomical injury; also in its action in forming by simple coagulation; in its destiny; in its instability; in its special tendency as an exudate to degenerate first peripherally, and from without inward rather than from within outward, which is the rule in an inflammatory exudate; and finally in its quick liquefaction and, as a rule, in typical cases, entire removal. In its effect upon the pulmonary structures involved this process is not similar to an inflammation, being entirely negative. It differs also in its limitation to certain parts of the organ affected, in the unequal progress of its advance and development, and in its preference for certain sites of development.

From personal observations by the author in hospital and private practice, cases of extensive consolidation, involving a lobe or entire lung, have resulted as favorably as others in which it has been less extensive. In fact, his observations justify the statement that the more extensive and well-defined consolidations have formed, the more rapidly they have undergone degenerate softening, the more promptly has the pneumonic crisis occurred, and the more favorable have the final results been. He would therefore conclude that the facts do not sustain the teaching that a more extensive local process necessarily implies a more unfavorable result; but, on the contrary, that they do afford ground for a justifiable inference that, as a rule, the more extensive the local processes, the more favorable the prognosis.

Treatment.—In an editorial on the plans of treatment pursued in the leading hospitals of Philadelphia, New York and Boston, the *Medical News* says that the uniformity in principle underlying the varying details is striking. In each instance the plan followed is essentially symptomatic, and it is tacitly admitted that we have no specific remedies against the disease. It is interesting to note how little stress is laid upon the value of arterial sedatives. With the recent endeavors to bring pneumonia into the category of parasitic diseases, we have attempts to establish an anti-parasitic plan of treatment, but so far without any special success.

Dr. J. H. Ripley³⁰ detailed, in a paper read before the New York Academy of Medicine, a number of experiments made in order to test the efficacy of quinine as an antipyretic in pneumonia. The drug was administered as early as possible after the onset of the disease, and only when the temperature reached 103° F. Experiments lasted from 4 to 12 hours. In 20 experiments a single dose of the sulphate in solution, by the mouth, was given; in 5, thirty grains; in 3, thirty grains daily in five grain doses every 2 hours; in 2, thirty-five grains in the same way; in 8, forty grains in a single dose, by the mouth; in 3, twenty grains hypodermically; in 3, fifteen grains hypodermically. Results: In one case a reduction of 4° took place after a dose of 40 grains by the mouth. There were five instances of a reduction from 2.1° to 2.5°, showing a reduction of from 1° to 1.8°; 14 showing a reduction less than 1°. 2 showed no reduction, and 2 a slight elevation. The reduction was always of short duration, generally only a

fraction of an hour. The effect on pulse and respiration, as to frequency, was not uniform. Both were generally slower,—at times one was hurried and the other retarded. Practically, so far as can be judged from the experiments, the most that can be expected of from 20 to 40 grains of quinine, prescribed daily to patients in active stage of acute lobar pneumonia, is that it will reduce the temperature 1–2° F. in about half the cases, while in the other half the reduction will amount to less than 1°. Contrasted with its inefficiency as an antifebrile are some marked deleterious effects on the digestion, circulating and nervous systems, including anorexia and nausea, and, in large doses, retching and vomiting. Marked cardiac weakness, profuse and often cold perspiration, profound nervous depression, somnolence, delirium, muscular twitchings, tremblings, and dilated pupils were some of the results. The author believes that large doses of quinine should be abandoned in the treatment of pneumonia. Dr. Fruitnight's experience coincides with that of Dr. Ripley. Dr. Castle found that if given in antipyretic doses it must be at the expense of the nutrition of the patient.

Dr. Jacobi¹ writes that the main indication in pneumonia is not the reduction of temperature, and that quinine, therefore, is useful in lessening pulmonary congestion and increasing the force of the heart's action. It is often difficult of administration to children, since it causes vomiting, but good effects are obtained and gastric irritation avoided by giving it in divided doses frequently repeated. Dr. Ady⁶ has prescribed it for the last 20 years in doses as large as 100 grains in the course of four hours.

Prof. Lépine,²⁴ believing the disease to be infectious, addressed his treatment directly to the *materies morbi*, upon which it is supposed to depend, by intraparenchymatous injections. He pushed a long Pravaz needle through the intercostal space to the depth of 2–3 centimetres into the lung at a level of the hepatized portion, and injected a small quantity of an antiseptic solution. By slightly withdrawing the needle and inclining it in other directions, he injected the hepatized tissues at short distances apart. The medicinal agents employed were benzoate of sodium, iodide of potassium and the bichloride of mercury. Favorable results followed the use of mercury only 1–40000.

Dr. Ransom,³¹ following the suggestions in Dr. Shingleton's

paper on intrapulmonary injections, treated a series of cases in that manner. A woman of 33, who had some time previously suffered from an attack of pneumonia, had an offensive breath, dark-colored expectoration with extreme fetor. Tubercle bacilli were not present. A diagnosis of gangrene at the base and a bronchiectatic cavity of the left side was made. Inhalations of carbolated air and eucalyptus oil diminished the fetor of the breath and sputum. From this time on, daily injections of an ethereal solution of iodoform were made into the two cavities; later an emulsion of iodoform in olive oil was used instead. The patient gradually improved, the bronchiectasis disappeared, as did the fetid expectoration and cough. One year later the cavity was still perceptible, though cough and expectoration had ceased entirely. In the second case, the injections were made at the apex of the lung, causing considerable pain. They were discontinued after two injections, no good being perceptible. In a patient suffering from a tuberculous cavity in the right apex, injections were made every third day for some time, when the symptoms indicated general infection, the patient dying soon after. Results in other cases were rather discouraging. Care must be taken not to inject the medicine into a blood-vessel. In one case pneumothorax followed the injection. The most satisfactory injection was the iodoform in oil of eucalyptus.

H. C. Wyman²⁸ reported to the Detroit Academy of Medicine a plan of treatment employed by him in pneumonia, œdema of the lungs and other conditions producing dyspnœa. A line of garden hose, 30 feet long, was partly coiled in a tub and covered with ice. To one end of the hose a bellows was attached, and the other brought near the mouth and nostrils of the patient, into which a stream of cold air was by this means forced. In the discussion following, several members expressed a doubt as to whether the good results which followed were due to the agency of this treatment.

Dr. W. B. Sawyer³² employed oxygen in two cases of catarrhal pneumonia following pertussis. The oxygen was administered by inhalation through the nose from bags containing the gas. Much was necessarily wasted in this way; but nevertheless it served to relieve the symptoms of carbonic acid poisoning whenever administered. Sevestre⁶ considers calomel the best disinfectant in

broncho-pneumonia of intestinal origin. Taylor¹ says that quinine given promptly and freely, will prevent the return of paroxysms in pneumonia complicated by malaria.

PLEURISY.

Etiology.—It has become quite fashionable in later years, says Mesnard,³³ to regard almost all cases of pleurisy as tubercular. Landouzy, who is an ardent adherent of this view, admits that rheumatism is at times a cause. It is granted that tubercular patients are predisposed to attacks of pleurisy, both previous to and during the evolution of the tuberculosis, as the history of an attack of benign pleurisy is frequently given by them. The histories of cases and autopsies are given in which no trace either of active or healed tuberculosis can be found. Some cases that seemed to uphold Landouzy's theory were found on the post-mortem table to have no tuberculosis. Mesnard concludes that if pleurisy should be shown to be a tubercular disease, that it must be a milder type than is usually met with. In a large country practice, extending over a period of 30 years, Bourdisson² has treated at least 150 cases of pleurisy, of whom not more than two or three afterward succumbed to tuberculosis. This should be a sufficient answer, in his opinion, to Landouzy's statement that he had never seen a complete autopsy of a case of pleurisy from exposure without traces of tuberculosis. Since Landouzy denies the existence of a serous inflammation of the pleura, he must also deny the serous inflammation of the membranes of the brain, heart and abdominal cavity,—a position which he certainly could not sustain.

Handford³⁴ reports 11 cases with large effusions. Not one appeared to be tuberculous on admission, but one had a tubercular family history. In 4 tuberculosis developed. The effusion was purulent in 6 cases. Of the 5 cases of serous effusion, 3 proved to be tubercular. Exposure, which is the apparent exciting cause in weak subjects, has little effect on stronger individuals, but mental depression, alcoholism, deficient food and early child-bearing are frequent causes. The association of tuberculosis is quite common; but whether as cause or effect is, in Handford's opinion, open to doubt.

Symptomatology.—O. Rosenbach³⁵ conducted a series of experimental investigations into the results of the diminution of

the pleural cavity. The technique of the experiments consisted in the injection of oil into the pleural cavity and the introduction of dilatable rubber balloons. Open pneumothorax does not change the arterial pressure. In closed pneumothorax the pulse becomes slower, respirations more frequent, and the arterial pressure sinks, oscillates and returns to the normal or rises slightly above it. The injections of oil caused slowness of the pulse, increased respiratory action with dyspnoea and normal blood pressure. If the injection was continued until the pressure sank, death usually followed. The inferior vena cava was then found distended with blood and its lumen compressed at its point of passage through the diaphragm. If both pleuræ were injected, respiration and pulse became more rapid, arterial pressure remaining normal or sinking slightly. The fact that the arterial pressure varies so little is owing to the compensatory regulating apparatus. As the action of the heart is one of these, conclusions must be drawn from the blood pressure and not from the frequency of the pulse. A condition of arterial anæmia and venous hyperæmia is produced. The anæmia of the brain is shown by the irritation of the vagus, vaso-motor and respiratory centres. The arteries contract and keep up the blood pressure until the return of venous blood is so small that the heart is not sufficiently filled, when all compensation ends. This is probably the cause of sudden death in man when a high degree of cardiac weakness is missing. He agrees with Bartels as to the twisting and compression of the inferior vena cava. He does not regard exudations of the left side as more dangerous than those of the right side. Occasionally distension may result in the production of the *pulsus paradoxicus*, due to the one-sided action of the diaphragm, which during inspiration temporarily narrows or obliterates the lumen of the vena cava inferior.

E. Weill³⁶ gives the histories of a number of cases of sudden death. One was in a man *æt.* 67, on the 25th day of the illness. The autopsy revealed about $1\frac{1}{2}$ litres of serous fluid in the left pleural cavity. The heart was large and flabby. A microscopical examination of the heart muscle showed that it contained neither fat, granules, nor pigment, but that fragmentation of the myocardium in cellular segments (Renaut and Landouzy) and a general sclerosed condition existed. A series of cases are given in which death was due to cardiac or pulmonary thrombosis or embolism,

always on the right side of the heart or in the vessels connected with it.

The conclusions are: (1) Sudden death in pleurisy is due to thrombosis or embolism of the heart or pulmonary artery, œdema of the opposite lung and degeneration of the myocardium. (2) Such causes as syncope, mechanical impediments to the circulation from displacement of the heart, and torsion of the great vessels and hypothetical lesions, such as multiple cerebral embolism, may be provisionally accepted, but require further investigation. (3) Sudden death occurs oftener in right than in left pleurisies; it may take place in acute or chronic cases when the effusion is progressive, stationary or retreating. The effusion is generally serous. (4) Fatal cases may or may not be accompanied by special symptoms, such as attacks of dyspnœa, syncope and irregularity of the pulse; but quite frequently death will occur unexpectedly without premonition and produced by some movement or effort. (5) Paracentesis is the only prophylactic or therapeutic measure and is indicated by the onset of threatening symptoms or evidences of increased intra-pleural pressure.

Trocquart³⁷ states that formerly a hæmorrhagic effusion was regarded as a very serious symptom; but since Moutard-Martin has shown that it may be due to neomembranes as well as to tuberculosis or cancer, it is not so unfavorable. The differential diagnosis is difficult between these three conditions. The tubercular effusion is seldom large enough to require puncture, and in the other conditions can be distinguished by the subsequent course of the disease. As the pleural cancer is generally secondary, the other organs must be carefully examined for the seat of primitive lesion.

A teamster was admitted to the medical clinic of Professor Baccelli, Rome, with the following history: After springing from his wagon to the ground, he experienced a sharp pain in the left side. He was brought to the clinic, when he suffered intense pain. A pleuritic exudation accumulated rapidly with high fever, but recovery was complete. The patient had suffered with malaria, and had a very large spleen, which was supposed to have ruptured the diaphragm when the patient jumped from his wagon, as it was greatly distended by the tumor.

Another case bearing some resemblance to this one is reported

from the Friedrichshain Hospital, Berlin. A tinner's boy fell from the roof, several stories high. He had a great deal of pain in the left side, but in a few weeks was at work again. The following summer while at work he again suddenly experienced sharp pains in the left side. From this time he suffered with intestinal obstruction, and was brought to the hospital with the symptoms of an ileus, a pleurisy with effusion on the left side, and a slight pneumothorax. The post-mortem revealed a rupture of the diaphragm through which a fold of the colon had passed, giving rise to a fetid empyema. The fall from the roof probably caused an injury to the diaphragm, at which point an unusual muscular effort produced a complete rupture.

Jaccoud²⁷ reported a case of dry diaphragmatic pleurisy. A young man taken ill with a chill, fever and pain, had orthopnoea without cyanosis or high fever. There was albumin in the urine, but the dyspnoea was not uræmic, because cyanosis was absent, and the urine contained 29.5 grams urea to the litre with a specific gravity of 1030. Inspection showed that the lower part of the thorax and the abdomen remained quiet in respiration. There was dullness over lower part of the left lung and coarse friction sounds, which could be heard on both sides behind. Diaphragmatic pleurisy is said to be rare; but this is only true of the variety with effusion, which is usually rapidly fatal. But the dry variety is common, and is only serious in its after-effects. It never ends in resolution but in adhesions, not only between the diaphragm and lung, but also between the diaphragm and costal pleura, which fixes the diaphragm at different levels and diminishes greatly the vertical diameter of the thorax. Occasionally the diaphragm is drawn up as high as the fifth or sixth rib; in one case it was found to be adherent to the fourth rib, but it is usually attached to the seventh or eighth rib. Such a deformity is a source of inconvenience, and also of danger. If under such circumstances a second pleurisy with effusion should take place, the physician's trocar might pass into the peritoneal cavity, the spleen, kidney or heart.

This condition can be diagnosed by observing the inspiratory retraction of the sides and lower intercostal spaces and the rapid return to their original position during expiration. This is an absolutely distinctive sign.

Diagnosis.—Gibb³⁸ shows that in the diagnosis of a fluid

effusion, a dull percussion note devoid of all resonance, with a sensation of peculiarly dead resistance, are two signs of great importance in absence of other physical signs. If the dullness is quite extensive, resonance may still be found at the inner end of the upper interspace, in front and high up between the scapulæ behind. Respiratory murmur, vocal fremitus and vocal resonance are more or less changed,—one sometimes out of all proportion to the rest, especially when the effusion is small. When the volume of the fluid is large, these signs are nearly or quite suppressed. About the angle of the scapula and in the subclavicular region; tubular breathing is the rule, an area of dull tympanicity above. Dullness in the lower region is a sign of considerable effusion, and is caused by the compressions of the lung. The symptoms show the presence of fluid before the signs of displacement appear. The effusion may be purulent from the beginning. This is usually shown by severity of the symptoms, but these may be misleading. They are repeated rigors, high temperature after the third week, great pain, œdema of chest wall (Bacchelli's sign), with long-continued and copious effusion.

Treatment.—At a meeting of the Boston Society for Medical Observation Dr. Sherman³⁹ reported several cases of pleurisy treated with aspiration and according to Hay's plan. In cases of chronic effusion without urgent symptoms he advised use of saline cathartics first and aspiration afterward, if necessary. Puncture with the hypodermic needle, to establish the diagnosis, should precede every aspiration, which should be slow and gradual, and made below the angle of the scapula or in the middle axillary region, without an anæsthetic, and with the patient in a sitting posture, except in case of cardiac weakness, when the recumbent position is preferred. The dangers commonly ascribed to aspiration are due to its improper performance or to its being too long delayed.

According to Jaccoud,²⁷ dyspnœa is not the only indication for thoracentesis. When present and caused by the effusion, it is an important one. In patients without dyspnœa, the side must be taken into account. In right pleurisy, immediate danger is absent, and internal medication should be tried as long as the fever lasts; when this has disappeared aspiration must be performed at once. In left pleurisy without dyspnœa, but with displacement of the organs, the operation is necessary.

Gibb³⁸ says that the treatment of sero-fibrinous effusion is often very simple, and the patient is well in a few weeks. Fränkel recommends acetate of potash, cinchona and flying blisters. Iodide of potash he regards as inert. Sometimes, however, the effusion is so large as to place the patient in a critical condition, when operative interference becomes necessary. The arguments against tapping are chiefly occasioned by faulty methods of performing it. The rules are to tap when the fluid rises above the middle of the scapula; when the accumulation fills more than half of the cavity and remains stationary for over a week even if the fever continues; when the chest is full, the heart displaced, and the diaphragm depressed, even if there are no urgent symptoms; and when the patient is losing flesh, with malaise, feeble circulation, irregular pulse and dyspepsia. The point of selection for puncture is the seventh or eighth interspace in front of the posterior axillary fold. Purulent effusions should be treated by free incision and drainage.

Dr. Westbrook¹ states that in certain chronic cases it is impossible to withdraw all of the fluid with the aspirator, as the thorax can not sink in, the lung can not expand, and the diaphragm can not rise high enough to obliterate the cavity. In such cases aspiration becomes exceedingly painful and must be discontinued.

The author suggested an operation for this condition in 1886, which he has since performed. The case was a man, æt. 60, in whom quite a large cavity existed, which could not be emptied with the aspirator. The operation consisted in the removal of pieces from the sixth and seventh ribs, about $1\frac{1}{2}$ inches in length. A separate incision was made over each rib and the cavity was not opened. The wounds closed at once. Two months later the man died of tubercular meningitis. The cut ends of the ribs were in contact and firmly united by fibrous tissue. A cavity about an inch in depth existed between the ribs, and the lung was filled with serous fluid. Westbrook thinks the operation can be performed, even in old persons, with reasonable hopes of securing primary union in the wounds; that there is no danger of producing an empyema; that the cavity will be greatly reduced, and that the cough and expectoration will be diminished. He suggests that probably more ribs should be resected.

EMPYEMA.

Etiology.—Gaucher²⁷ reported two cases of empyema due to influenza. The first, a woman, three days after childbirth, showed symptoms of influenza. Excessive weakness, headache, anorexia, sore throat, cough and fever, were followed in a few days by pain in the side, dyspnoea, and symptoms of pleuritis. The second, a man 27 years old, exhibited the same symptom. In both cases the pleurisy was purulent from the beginning, and terminated in resolution. Influenza as a factor in the causation of pleurisy is exceptional and hard to explain.

Netter⁴⁰ has found the pneumococcus in cases of pleurisy following pneumonia. Friedländer, Salomon and Fränkel have had the same experience. Netter concludes that the pneumococcus frequently occasions primary pleurisy, which has the same course and symptoms as that accompanying pneumonia.

Diagnosis.—Dr. McPhedran²¹ said that in this condition in children we do not find the heart displaced, and but little alteration in the shape of the chest. Bronchial breathing and bronchophony are nearly always present. From the retractile energy of the lung small effusions are fixed and immovable, not changing position with movements of the patients, as is usually taught. The upper border of dullness is, for the same reason, a curved line with its highest point in the axillary region. Russell²⁵ states that the physical signs, when the effusion is scanty, are often indefinite. The local dullness is slight, and may be overlooked. Percussion is of little value unless done with extreme lightness. Breathing is normal over the affected side, or slightly softer than the puerile. There is always danger of mistaking a case of moderate pleural effusion for a pneumonia. Dr. Holly²⁰ saw a case of so-called carcinoma of the lung which was simply pleuritis, the exudation having become pyæmic. Two gallons of pus were withdrawn. Hall²⁰ saw a case that had been treated as mountain fever, resisting all remedies. The patient, after expectorating large quantities of pus, which came through a ruptured bronchus, made a tedious recovery, with much deformity. Fraentzel⁴⁰ bases the diagnosis of empyema on high fever, becoming hectic after from two to five weeks, pains on pressure, and constant pain and œdema of the affected side. Immerman³⁵ states that in the grade

and duration of the fever we have a reliable diagnostic point between serous and purulent exudations, the intermittent fever of the former disappearing when the inflammatory action ceases, and in the latter case, lasting as long as the pus remains, and disappearing when it has been given a free opening. Should the fever return in a case of pleurisy in which the exudation can still be shown to be present by physical examination, this return means either a renewal of the inflammation or a purulent change in the character of the exudation, or is fever due to its absorption into the circulations. The increase or decrease in the quantity of the exudation and the hypodermic needle readily shows to what the fever is due.

Prognosis.—Russell²⁵ says that where an effusion has been diagnosed, the course of the disease is quite unsatisfactory unless the fluid is removed, when many cases will make a rapid recovery.

Treatment.—Immerman³⁵ states that aspiration is indicated and should be performed at once when the adhesions have grown so strong as to prevent expansion, and the exudations remain stationary or increase. The aspiration should be repeated as often as necessary and at regular intervals. The quantity of the fluid is sometimes a vital indication for operation. When dyspnoea and cyanosis are marked and œdema of the other lung is threatened, or when great displacement of the heart is found, it should be performed at once. The evacuation of an old exudation with displacement of the heart may produce sudden death by the formation of thrombi. The operation should be performed when the fluid remains stationary after the fall of the temperature, and as soon as an exploratory puncture has shown the presence of pus. This latter is rendered probable by the long duration of high fever, when the exudation comes on during an attack of any acute infectious disease, or in a cachectic individual. The presence of pus is an imperative indication for operation, as any prospect of absorption is practically excluded. Aspiration is not sufficient, and an incision with resection of one or more ribs is usually a necessary operation.

Immerman, however, does not recommend this operation on account of the deformity following it, or the various complications which may arise. In his opinion, the ideal operation is that called in Hamburg the Bülau operation, and consists of siphon

drainage, which is particularly applicable in more recent cases in which the lung is still capable of being fully distended. It is to be carried out as follows: a thick trocar is thrust in between the ribs, and the moment it is opened a disinfected drainage-tube, which exactly fits in the canula, is passed into the pleural cavity as far as possible, and closed by a clamp. The canula is then carefully extracted, a second clamp applied to the tube between it and the thorax, when the first clamp is removed and the canula slipped off. The rubber tube, which should be a metre and a half long, is now attached to a glass tube, which passes through a rubber cork almost to the bottom of a bottle partly filled with some antiseptic solution. The bottle should also have a mouth-piece through which any necessary suction may be made, should the drainage-tube become clogged up at any part of its course. The patients are soon able to go about, carrying their bottle with them. The author thinks that in some cases the intercostal spaces will be found too narrow to admit the trocar, especially in children; and that in old cases with partial collapse of the thorax, the lung will be found to be so bound down by old adhesions that it can not expand sufficiently to fill the pleural cavity. Excision must then be practiced. Some cases may be found with atrophic muscles in which the tissues will not encircle the tube hermetically, and consequently air will pass into the pleura by the side of the tube. This may be remedied by an air-tight dressing and by irrigating the cavity through the tube. In septic cases this irrigation should always be practiced. Dr. Simmonds has performed this operation with success upon 14 children, one only 6 months old. Dr. Powell,²¹ of Toronto, reported 6 successful cases treated by siphon drainage. The Nélaton catheter used was held in position by being drawn through a small hole punched in a piece of strong rubber bandage, which was fastened around the chest. The free end of the catheter was attached to a glass tube, which passed through a rubber cork into a bottle containing a solution of carbolic acid. To wash out the cavity the bottle was alternately raised and lowered.

According to Mader,²⁷ aspiration is a simple and harmless proceeding, and should be practiced for diagnostic and therapeutic indications. He lays great stress upon the importance of keeping the quantity of water consumed at a minimum, both before and

after operating. In empyema he applies an apparatus of his own device over the incision, which permits through a valvular opening the egress of the contents of the pleural cavity, but does not allow the entrance of air. If the effusion be old and circumscribed, giving rise to no pressure symptoms or fever, Pollok³⁸ prescribes change of air, with anti-strumous remedies, such as iodide of iron and chloride of calcium, in addition to the local application of the oleate of mercury. If the effusion, whether acute or chronic, gives rise to respiratory or cardiac embarrassment, or septic phenomena, the fluid should be evacuated and the operation repeated, if necessary. If the fluid be found fetid, a free incision should be made, the pleural cavity washed out with an antiseptic solution, and good drainage established.

Griffith¹⁹ treated 50 cases by incision at the Leeds Infirmary, 35 of whom recovered. In 4 there was suspected phthisis; 5 were discharged with the sinus still open; 6 died, 3 from advanced phthisis. Dr. Boeckel⁴¹ reports a case in which he resected seven ribs and part of the scapula. The patient recovered and gained in weight. Holsti⁴² resects a portion of one rib, inserts two drainage-tubes, and uses antiseptic dressings. He has treated 27 cases since 1883, 24 of whom were cured, 2 were discharged with fistula, and 1 was under treatment at time of report.

EMPHYSEMA.

Bouveret,²⁴ while bleeding a robust Alsatian to relieve certain conditions of an intense capillary bronchitis, observed at the moment of bleeding very strong venous pulsations, isochronous with respiratory movements. The vein swelled during expiration and diminished greatly in volume toward the termination of inspiration. After withdrawing 400–500 gr. of blood, improvement occurred, but 24 hours later the conditions returned and the venous pulse reappeared. It was also very marked in the other arm, from which the patient was bled a second time, permanent improvement following. M. Bouveret then sought the same phenomenon in other patients in his service, and found it in two emphysematous cases. The pathogenic conditions of this special venous pulse seemed to be dependent upon an acute emphysema. This latter increases the intrathoracic pressure which is felt on the right side of the heart and the larger veins, interfering with

the return of venous blood from the upper extremities. Under these conditions the blood returns to the heart most easily at the end of inspiration. The mechanism is somewhat analogous to that of glaucoma.

ABSCESS OF THE LUNG.

A. V. Meigs⁴³ reports the case of a boy 8 years old who had been sick for three years, beginning with an acute attack, in which an abscess developed, discharging considerable pus. Physical examination revealed dullness of the right lung in the region of the third rib, with a cracked-pot sound extending down to the liver, the respiratory sounds being harsh. Posteriorly the apex was nearly normal, but from the middle to the base of the lung expiration was prolonged, sounds feeble and somewhat harsh. There was dullness over this area. Large quantities of pus were expectorated after a violent fit of coughing. From the symptoms present, and the distinctly clubbed fingers, Dr. Meigs believed that there was a cavity in the chest in which pus collected. Abscess of the lungs may come from an empyema with rupture of the lung and discharge of pus through the bronchus. It has been known to follow pneumonia or the lodgment of a foreign body in the bronchus. It is often difficult to differentiate between abscess of the lung and gangrene, except that in the latter the pathological conditions and course may have a causative influence in the production of the result. Meigs claims that the distinction that an abscess has a pyogenic membrane and that gangrene is destructive of the lung and accompanied by decomposition, will certainly not hold good, and we can therefore draw no line of demarkation. The physical signs in a case of this character, when seen early, are much the same as in an ordinary pleurisy with effusion: dullness on percussion, as a result of pus in the thoracic cavity, or of thickening of the pleura. The author thinks gangrene cannot terminate in recovery, while abscess may.

A patient presented himself at the London Chest Hospital,⁴⁴ with pain, cough and shortness of breath. Examination showed absence of movements of left side of chest, with anterior and posterior dullness; tubular breath sounds, with vocal resonance and fremitus increased; right side healthy. In the course of a few days the temperature ran up from normal to 103.8, but soon fell again; night sweats with a free fetid expectoration set in. At

the suggestion of Dr. Samuels, an aspirator needle was inserted between the fifth and sixth ribs and two ounces of fetid pus drawn off. Considerable tumefaction at the joint of aspiration followed, and a free incision was decided upon. About three ounces of pus escaped; the cavity was washed out and a drainage-tube inserted. Until this time it was thought the pus came from the pleural cavity, but when a few days later a portion of the seventh rib was resected, and the thickened pleura incised, it was shown that an abscess of the lung about the size of an orange was the source of the pus. The cavity was washed out with a solution of perchloride of mercury 1-500 and a drainage-tube inserted. The patient began to improve in every respect; but on the evening of the fourteenth day he was suddenly seized with an epileptiform attack, followed by paralysis of the right arm. In an attack similar to this a few days later he became unconscious, was completely paralyzed, and died five days later. Post-mortem showed healthy granulations in the cavity of the lung. Smaller abscesses were found in the upper portion of the lung. The disease undoubtedly originated in pneumonia, and the close proximity of the pleura caused an extension of the inflammation and adhesions. Abscesses of the brain, the cause of death, were undoubtedly embolic in origin, which is claimed to be the rule in abscesses of the lung or pleura.

Dr. Runeberg,⁴² of Sweden, performed pneumotomy with success in a case of pulmonary abscess following pneumonia, and he collected the history of 10 other similar cases. Discarding 3 of the 11 on account of uncertainty of diagnosis, 5 of the remaining 8 recovered, and of 3 that were fatal, death could not be attributed to the surgical operation. He therefore thinks that pneumotomy is indicated when the diagnosis is clear and the situation accessible. In a case of gangrene, with bronchiectasis and bronchitis, the patient finally died from secondary gangrene and septicæmia. In 17 cases of gangrene collected from medical literature, where pneumotomy was performed, 7 recovered more or less completely. The lung should be opened by resecting a rib and then using the thermocautery. He thinks antiseptic lotions dangerous and thorough drainage sufficient. He mentions two cases of pneumotomy made for the removal of *ecchinococcus*. In gangrene and tubercular cavities the operation cannot be recommended.

ASTHMA.

Etiology and Pathology.—Schlemmer reviews the principal experiments upon which the German physicians place their greatest reliance. Traube admits that in normal respiration, the CO_2 which accumulates in the lungs excites the crepitant fevers. When the lungs were charged with CO_2 Knoll found no inspiratory movements, and Brown-Séquard found a contraction of the bronchial muscles. Zuntz and Gypur conclude, from their experiments, that the blood exerts a direct regulatory influence on the respiratory centres, not only on account of the existence of O and CO_2 but also on account of an undetermined substance produced by muscular activity, the action of which continues for some time, even if O is in excess. Bremer³¹ has continued his experiments to discover the cause of bronchial asthma, and states that the acute distension of the lung is now a generally recognized characteristic feature of the asthmatic paroxysm; but considerable controversy has been raised as to how this condition is brought about. His theory is that it is a bronchial spasm, and a very large number of observers, among them Germain Sée, attribute it to diaphragmatic spasm. Bremer has endeavored to show by his experiments that simple lung enlargement cannot be identified with the lung enlargement of asthma. The catarrhal symptoms and dyspnoea usually remaining after an attack of asthma are not due to a catarrhal affection, but are caused by a bronchial spasm, and on this hypothesis only can we satisfactorily explain all of the clinical symptoms following an attack of asthma.

Lazarus,⁴⁵ of Berlin, says that in 15 per cent. of all the cases the disease can be proved to be hereditary. Schadowald maintains that bronchial or true asthma is due to a neurosis of the trigeminal nerves.

Fraser⁴⁶ states that the great difficulty in asthma seems to be to expel the air from the chest, and the respiratory muscles are strained to the utmost to accomplish this end. The normal relation between inspiration and expiration is found to be reversed; sometimes the latter is two or three times as long as the former. Anatomical lesions sufficient to account for this disturbance have not been found, and the theory generally accepted is the one advanced by Cullen, Romberg and others, that

it is brought about by a spasmodic contraction of the bronchial muscles.

Brandau,⁴⁵ of Kassel, contributes a lengthy article on the relation of habitual hyperhidrosis pedum and bronchial asthma. He believes that pharyngitis, rhinitis, and tumors found in the naso-pharynx, etc., have no causative relation to bronchial asthma. In a large number of patients we find hyperhidrosis antedating the asthma, and the relief of the former causes the appearance of the asthma, as well as of the mucous membrane complications. He reports three cases in which, the hyperhidrosis pedum being checked, the asthma was cured. He believes that the stockings being continuously wet, and the feet consequently cold, frequently causes asthma.

Treatment.—It is claimed by Salter⁴⁷ that every case of asthma has a climate that will cure it. At the same time we have no means of judging beforehand what climate will be of benefit. It is a generally accepted fact that the dusty, smoky and dirty air of the city is of more benefit or better than the pure air of the country.

Pyridin, introduced by Germain Sée,⁴⁸ is claimed to be very efficient, whether the disease is of cardiac origin or otherwise. About a drachm of the drug is placed on a hot plate in a small room, the patient paying frequent visits to the room and inhaling the vapor. After two or three séances the râles disappear, the expectoration is more free, and sleep at night is once more obtained. In many cases the improvement is permanent, while in others the effect of the medicine passes off in five or six days. In this latter class of patients the pyridin treatment is of good service when the patient can tolerate it. Kelamin,⁴⁹ of Buda-Pesth, has found pyridin successful in both inspiratory and expiratory dyspnœa, subjective and objective being alike relieved. The peculiarities of the patient seemed in some instances to influence the result.

Dr. Solis Cohen⁵⁰ reports a case of asthma cured by the Bergeon method. One injection caused instantaneous relief and after six injections the patient professed herself better than she had been for years; while auscultation revealed only normal breath sounds. This report confirms the experience of Morel by the same method.

Fraser⁴ praises the good effects of nitrite of amyl in the

dyspnœa of asthma. This drug causes dilatation of the blood-vessels of the bronchi, and when administered frequently in small doses, the dyspnœa, dry râles and cough soon disappear. Fraser believes that conclusive clinical evidence can be brought to bear that the diaphragm is not involved in the production of the dyspnœa of asthma. Where this symptom is produced by an accumulation of mucus or other inflammatory products, the nitrites would naturally fail to give complete relief or to silence the abnormal sounds.

Benjamin Walker,⁴ while treating this affection on the same principle as to cause, employs different remedies. He claims that the nitrites produce only temporary benefits, and calls attention to the value of hyoseyamus given in doses of $\frac{1}{136}$ of a grain, every half hour until the spasm disappears. Usually it requires about 3 doses to bring about this result. Small or tonic doses of arsenic combined with the hyoseyamus have a good effect generally, preventing the tendency to adynamia.

Quebracho root, in doses of 5 to 10 centigrams, internally, has also been recommended. *Euphorbia pilulifera* is considered by Matheson to be useful in asthmatic affections. Masset and Séc have found that it acts on the nerve centres, exciting the respiratory and cardiac and then depressing. Dujardin-Beaumetz has had success with the drug in asthma and emphysema. In cardiac and uræmic asthma, the agent seems to have but little effect; but in purely nervous asthma, all its good properties are brought out. The burning of nitre or the smoking of nitre cigarettes is a simple plan of relieving asthma. When employed during an attack, relief is only partial; but when used just before an attack comes, it is a most efficient agent and highly extolled. A mixture of tobacco leaves with one-fourth part of stramonium will make a cigarette as useful as any of the special preparations sold for the purpose. The respirations should be as deep as possible, in order that the fumes should reach all parts of the lungs.

Lazarus²⁶ believes that where general scrofula, pertussis, etc., act as predisposing causes of asthma, special attention should be directed to anti-scrofulous treatment, particularly of the nose and pharynx. He regards operative treatment necessary in cases of swollen nasal mucous membrane, hypertrophied tonsils, chronic ozaena, etc. Among the new remedies for asthma, he has found

paraldehyde, pyridin and nitrite of sodium of little or no value. Amyl nitrite he has found useful in several cases, in doses of 4 or 5 drops placed upon a cloth, the patient inhaling the vapor. Nitroglycerine, cocaine and the galvano cautery have also been beneficial in some cases; but the sovereign remedy with him appears to be the iodide of potassium, administered with chloral, not less than 1 gram of each, once or twice during each attack. Lazarus also considers the pneumatic cabinet of the greatest benefit in such affections. In the discussion following the reading of this paper at the Berlin Medical Society, the general consensus of opinion seemed to be that the number of cases in which asthma was benefited by cauterizing the nasal mucous membranes on the turbinated bones, was extremely small. Schadowald believed that asthma should be treated by faradization of the trigeminal nerves. Lublinski thought that iodide of potassium deserved the name of a specific in this affection.

BRONCHO-PULMONARY MYCOSIS.

Waugh⁵ relates a very interesting case of a man who was compelled to work in a vault where the body of a woman who died with consumption had been placed. This body had burst and the fluid had overflowed from the coffin and created a terrible stench. The workmen all refused absolutely to go near. After a quantity of chloride of lime and carbolic acid had been thrown into the vault, the patient entered. As soon as he began to inhale the mephitic air, he experienced the peculiar sensation of "taking cold." He remained at home for a few days. A cough developed which annoyed him constantly. He had night sweats, and the temperature rose to 102.5° F. Expectoration was colorless but abundant,—“altogether a typical bronchorrhœa.” The sputum did not dry when exposed to the air, but in a short time became non-liquid. Dr. De Lannoy found it to contain no tubercle bacilli, but to fairly swarm with putrefactive forms,—the so-called microbacteria. He judged the trouble to be lodged in the smaller bronchi, and that the necessarily long-continued retention of the expectorated matter might account for the large number of microorganisms. The patient recovered sufficiently in a few months to be sent to San Antonio, Texas, where he is improving rapidly. Beyond doubt this appears to be a case of bronchorrhœa with

putrefactive bacteria, proving clearly that other bacilli or bacteria besides the tuberculous may also cause liquefaction. The followers of Cantani's method of curing tuberculosis, by introducing the bacterium thermo into the lungs to kill the tubercle bacilli, may by this observation learn that it is safer to make experiments on lower animals instead of studying their effect on man.

ŒDEMA OF THE LUNGS.

Grossman,⁵¹ of Vienna, has produced œdema of the lungs by the administration of muscarin to animals. It causes an obstruction and an increase of the blood pressure of the veins, the right auricle, the pulmonary artery and the left auricle, with a diminution of pressure in the aorta. This seems to be produced by spasm of the muscles of the heart. The stimulation of the accelerator nerve of the heart relieves the œdema.

According to Nothnagel,⁵² œdema of the lungs is often rapidly fatal, while in other cases the patient may suffer for days. Heart stimulants, such as champagne, are administered when the patient can swallow. Strong black coffee, rum, arrak, or a few drops of sulphuric ether may also be given. Ether may be administered hypodermically when the patient cannot swallow. It may be combined with camphor, and it may be necessary to administer it frequently. The administration of large doses of acetate of lead in powders of 5 centigrams every half hour until five doses are given, is highly recommended by the author. Blisters also have a favorable effect on the œdema.

ONE-SIDED CONTRACTION OF THE THORAX.

In a discussion at the Berlin Medical Society, Dr. Lewinski²⁶ maintained that the deformity following exudations into the pleural cavity are brought about by the active force of the muscles of the chest. A resorption of exudate from the pleural cavity is hastened by active expiratory efforts. Lewinski placed a patient with acute pleurisy in a prone position and with each expiration of the patient gradual but firm pressure was made on the thorax with the hand, which was discontinued as soon as the respiratory acts ceased. The patient felt much relieved after such a course of treatment, the line of dullness had receded and finally the duration of the disease seemed shortened in cases where this plan had been

carried out. Virchow was of the opinion that the chief agent in producing a change in the shape of the thorax, which may be so extensive as to cause overlapping of the ribs, is the contraction of the newly formed connective tissue in the pleura. Later it contracts and is found to be in a sclerotic condition, affecting the shape of the thorax as far as it extends. Guttman did not think that the treatment above referred to could effect a change in the line of dullness in a single séance, when removal of large quantities of liquor with the aspirator seldom made such a degree of difference.

PHTHISIS.

L. Meunier⁵³ has brought into prominence the fact that the only difference between the ancients and moderns as to the etiology of phthisis is the discovery of the bacillus of tuberculosis. Galen among the ancients; de Beauvais and de Vêrone in the 16th, Bererovic, Jouston and Rivi  re de Montpellier in the 17th, Van Swieten and Raulin in the 18th, and La  nnec, Grisolle, Chauveau, Villemin and Prof. Jaccoud in the 19th century, all held the same doctrine.

Heredity.—Firket,⁸³ of Belgium, says the transmission of phthisis may take place before conception, the tubercular bacilli being associated with the sperm or germ—a purely hypothetical idea—or through the medium of the placenta, and therefore solely by the maternal blood. He contends that there is not such positive proof of the infection of the maternal blood, and thereby of transmission of disease to the f  tus in the case of tuberculosis, as there is in anthrax, syphilis, variola and other affections. Moreover, he shows that in ordinary phthisis fully one-half of the cases do not exhibit, in the presence of remote secondary lesions, evidence of blood infection. It is for the most part a local disease of the lungs, and such secondary lesions as do occur may be explained in many cases apart from general blood contamination. The fact of the lung being the primary seat of tubercular disease in inherited cases is almost conclusive against the congenital theory; for if the f  tus were infected through the blood the chances are that the lungs would not suffer more than any other organ.

Transmission.—Cadeac and Malet²⁷ consider primitive tuberculosis of the lungs to be due to the inhalation of particles of dust loaded with tubercle bacilli derived from desiccated sputum.

From a series of careful experiments on animals they conclude that healthy animals as well as those affected with catarrhal inflammation of the air-passages, breathing air exhaled by tubercular patients do not contract disease. Animals living in the same atmosphere with tubercular animals for two or three months did not contract the disease, notwithstanding an existing predisposition. Two rabbits out of three cohabiting with tubercular rabbits contracted the disease. Inoculations of condensed vapor from tubercular sputum produced negative results. The condensed vapor of the atmosphere in two hospital wards occupied by phthisical patients was inoculated upon twelve rabbits and guinea-pigs, producing tuberculosis in two cases.

Trudeau⁴⁶ believes, from his researches and experiments on the subject, that though environment may bear but the relation of a predisposing cause to microbial infection, it is, nevertheless, a potent factor in determining the future type, and even the final results of the disease; and that if we may not under-estimate the pathogenic properties of the bacillus, the effect of extremes of environment on the resisting power of the cells of the body is an element in this complex problem which should not be ignored. Dr. Thos. J. Mays⁵⁴ has analyzed the records of 400 cases of pulmonary consumption, and shows: (1) That not all the members of large families are equally vigorous and alike resistant to pulmonary consumption, and that, as a whole, they are less vigorous than those of small families. (2) That the youngest members of numerous families, provided their parents are healthy and come from small families, are most liable to pulmonary consumption. (3) That the youngest and the oldest members of small families are liable to pulmonary consumption, while the intermediate members are less susceptible to it, even though the parents and grandparents were healthy and became aged; provided that either or both parents come from the youngest members of numerous families. (4) That children born of parents having phthisical antecedents are subject to the same law of liability as those children whose parents are healthy but come from the youngest of numerous families, with the exception that it is not necessary for one or both parents to come from the youngest of their families. (5) That those children who are born within a year after the birth of the preceding members are more liable to pulmonary

consumption than those who are born two or three years apart. (6) That children born of phthisical parents are liable to pulmonary consumption three years earlier on the average than those born of healthy parents. (7) That parents with family history of consumption are less prolific by nearly one-half than those who are healthy. (8) That, given a patient coming from a numerous family, of which the parents came from medium-sized or small but healthy families, we can predict that the patient is the youngest or one of the youngest of the family; or, given a patient coming from a small family, of which the parents came from numerous families and were among the youngest but healthy, we can predict that the patient either belongs to the youngest or the oldest, and not to the intermediate ones of his family; or, again, given a patient coming from a small family of which the parents came from a numerous family, but who have a phthisical history, we can predict that the patient belongs to either the older or the younger members, provided the patient's parents are not the youngest of their families; if they are the youngest, then the intermediate members are not exempt, although even then more so than those of either extreme.

Dr. Th. H. Buckler³⁹ has advanced the theory that excessive summer heat is the active producing cause of tubercular phthisis pulmonalis, including tubercle in whatever structures or tissues it may be found. As a proof he states that true acute consumption, a disease lasting from fifteen to thirty days, occurs during or immediately following a heated term. Dr. G. Halsted Boyland also believes in this theory and thinks it strange that it should have escaped the observation of German scientists, who, although they record a higher rate of mortality from acute miliary tuberculosis after an exceedingly hot summer, attribute the cause to the succeeding winter and not to the preceding summer.

M. Galtier⁴⁸ states that tuberculous virus possesses such powers of resistance that it retains its activity in water, in putrefied matter, on the surface of objects, in spite of desiccation, of variations of temperature, and even of congelation; therefore, excretions of phthisical patients and of tuberculous animals are a source of contamination and danger. He concludes that it is urgent to exact complete disinfection of all objects sullied by tuberculous animals, of their excretions, of the localities occupied by them, of

the litter and dung proceeding from them, etc., in order to prevent dissemination of the disease and its communication to man.

Ruhle,⁴⁵ of Bonn, believes that the disease is most frequently contracted from a tubercular person through the sputa, glands of the skin; by kissing or fondling the patient, handling his linen, etc. He does not believe in the theory of heredity. Butel,⁵⁵ a veterinary surgeon of Paris, thinks that the danger of contagion from animals is not sufficiently appreciated, and that the utmost energy should be exerted by the authorities to counteract this danger. Dr. H. M. Pond,⁵⁶ of St. Helena, Cal., relates a case of infection by drinking the milk of cows that seemed to be suffering from phthisis. Four members of the family were affected, one surviving through active treatment.

Drs. Spillman and Haushalter²⁷ state that they have seen flies enter the spittoons containing the sputum of phthisical patients. The flies were caught, placed in a bell-jar and on the following day some of them were dead. Examination of the abdominal contents and the excrement showed presence of many tubercle bacilli. The authors point out the wide dissemination of the disease which may take place in this way.

Dr. Lamallerée²⁷ related a very remarkable case of infection of tuberculosis from hens. The patient, a young woman whose antecedents could not lead him to suspect tuberculosis, but who, nevertheless, was suffering from incipient phthisis, incidentally mentioned that she had partaken of as many as eleven slightly roasted chickens obtained from a neighbor. This neighbor was a phthisical person, for whose spittle the remaining chickens always eagerly fought. The doctor came to the justified conclusion, that his patient had contracted the disease from these hens who had feasted on the sputum of a phthisical woman.

Destère and Slosse⁵⁷ state that from inquiries and observations made in Dr. Desmeth's wards during the present year it was found that, of 50 patients suffering from tuberculosis, contagion could be regarded as an undoubted etiological factor in 12, heredity in 30; no cause could be traced in the remaining 8.

Distribution.—According to Hirsch,⁵⁸ (1) Death rate from phthisis is about 3 in 1000, or nearly one-seventh of the total mortality. (2) The mortality from phthisis is relatively large in the large centres of population, viz.: Vienna, 7.7 per

1000, nearly twice the general average; Pesth, 6.9; Brussels, 5.6; Stockholm, 4.1; Munich and Glasgow, 4; Berlin and Dresden, 3.8. (3) There is an increased liability to phthisis with rapid growth of population, and especially with the massing together of large bodies of workers engaged in arts and manufactures. Impure air and bad hygiene are more important than heredity and imperfect nutrition. Among nomad tribes, such as the Kirghiz of Central Asian Steppes or the Bedouins of Arabia, the disease is unknown until these people settle in towns. (4) Geographical position has less influence than generally supposed. Phthisis is virulent in many warm countries, and the negroes, the West India Islanders and the South Sea inhabitants suffer more in proportion than the people of Europe. Italy and England have the same death-rate. The Hebrides and the Faroe Islands are almost entirely free from the disease. (5) Latitude has an influence upon the prevalence and type of phthisis. It becomes rarer as we approach the poles. In the tropics the disease is not chronic, but approaches the severity and brevity of acute tuberculosis. (6) Altitude is very potent. On the higher Alps, the Andes, the elevated plateaux of Mexico, Persia and South Africa, there is almost absolute immunity. Large populations, bad hygiene, and occupations which at lower levels are active assistants in promoting this disease, are here almost powerless. Switzerland has 1.86 to 1000 mortality. Santa Sirene⁴⁰ gives the death rate from phthisis in Italy as 2.4 per 1000 inhabitants, for Berlin 3.1, and for Vienna 7.0.

Dr. Washington Matthews, who has spent 21 years among the Indians of a dozen different States and territories, states that the number of deaths from consumption (U. S. census of 1880) is: whites, 166; negroes, 186; Indians, 286. The rate in the different States and territories is as follows: Nevada, 45; California, 70; Arizona, 83; Colorado, 107; Nebraska, 150; Montana, 176; Dakota, 200; Oregon, 240; Idaho, 250; Washington, 302; Michigan, 333; Wisconsin, 361; New York, 625. The general consumption rate of Dakota is 94, that of the rural districts of New York 152; while the Indian consumption rate of New York is three times that of Dakota. Dr. Matthews believes this evidence to show that under the influence of civilization, *i.e.*, a compulsory endeavor to accustom themselves to the food and habits of an alien

and more advanced race, consumption increases, and that climate is no calculable factor in this increase. He found but one place—Owen's Valley, California—in which consumption did not increase among the Indians. He is of the opinion that food is the principal cause of the disease with them, and cites the fact that when the supply of fresh beef is liberal the consumption rate is high.

Treatment.—The Bergeon Method.—Claude Bernard showed that gases which when inhaled are poisonous, can be injected into the bowels, absorbed into the circulation, and expelled from the lungs with perfect impunity. Acting on this suggestion, Bergeon, after experimenting with several gases and antiseptics, finally selected a mixture of sulphuretted hydrogen and carbonic acid as the agent best adapted to the purpose. He passes 4 or 5 litres of carbonic acid through a Wolffe bottle containing surphuretted hydrogen in solution. The carbonic acid thus impregnated with the sulphuretted hydrogen, is injected into the bowel, where it is absorbed into the veins of the large intestine and carried with the venous blood to the lungs. The object of the method is to permeate with the medicinal agent the whole lung structure, and come into direct contact with tubercular deposits and diseased surfaces. Bergeon claims that under it the cough and expectoration immediately diminish, the temperature falls, night sweats cease, the patients gain in weight, and in many cases may be regarded as completely cured. Cornil, Dujardin-Beaumetz, Bardet and others, while not as enthusiastic as the originator, all testify that they have seen marked benefit follow the injections.⁵⁶

Gas made with impure materials, or kept for a certain length of time in rubber bags, produces tympanitis and colic. The gas does not pass into or through the lungs, and it is not strange that it does not produce the desired effects. It should therefore be made from faultless materials, and a glass apparatus used from which it can be conducted directly in the rectum.⁴⁸ Dr. H. A. McCallum⁵⁹ prepares a perfectly saturated solution (not less than 8 hours should be taken for saturating cold water with sulphuretted hydrogen gas) of which ʒviii. are diluted with ʒxx.—ʒxxx. of water and securely corked in ale bottles. The contents of one of these, after warming to 90 degrees, are slowly injected into the bowel night and morning, in not less than 30 minutes time.

Dr. V. Morel, in his brochure on the subject, says that the

operation requires a certain amount of experience and precaution. The patient should lie on his back, and be so dressed as not to interfere with the distension of the abdomen upon the entrance of the gas into the large intestines. The first injection should be made cautiously and slowly, taking about 15 or 20 minutes, and by the physician himself, that he may note the susceptibility of the patient, the rapidity of absorption and elimination, and the manner in which the injection is tolerated by the intestine.

M. Bergeon⁴⁸ gives as contra-indications to the employment of the method, hæmoptysis of a profuse character, the invasion of at least half of the pulmonary structure as an obstacle to the elimination of gases, and cause of their accumulation in the body; aneurismal dilatations of the thoracic vessels. He also refers to the dangers arising from a bad application of the method, and the chances of failure from the employment of too active substances.

Among the cases lately reported by M. Bergeon²⁴ were two reported to the Medical Society of Lyons, in November. The first was a child of 12 years, whose mother died of pulmonary consumption. There was curvature of the spine which necessitated recourse to an iron corset. The gaseous treatment was begun Aug. 15, 1887. The thoracic circumference then was 59 cm. At the end of six weeks, during which time the treatment was continued without intermission, the child measured 62 to 63 cm. around the chest, the weight of the body had increased, the anæmia had disappeared, and there was greater tonicity of the muscular system. The second case was a young woman of 27, who had been treated for pulmonary tuberculosis by M. Lépine by subcutaneous injections, which she did not bear well. M. Garel obtained cicatrization of the ulcers of the larynx by cauterization, but two months after the patient was still voiceless. Auscultation showed the left lung to be involved two-thirds of its extent; 18 days after the adoption of the gaseous treatment the voice returned, general health improved and there was a slight amelioration in the state of the lung. At the time of report, there was a progressive diminution in the crackling rales. The ulcers of the larynx had also disappeared.

Dr. E. T. Bruen⁵⁹ treated 25 cases of phthisis in the Philadelphia Hospital by this method. Most of the patients suffered from advanced lesions, nearly all associated with cavities, marked

bronchial catarrh and some laryngeal lesions. His conclusions are given as follow: (1) In nearly all cases lasting effects have been secured in the reduction of temperature, suspension of night sweats, diminution of cough and expectoration, and in some all physical signs of bronchial catarrh were abolished. (2) Temporary reduction of pulse rate 15–20 beats, and temperature $\frac{1}{2}$ to 1 degree during the administration of gas. (3) The amount of gas introduced into the bowel has varied from 3 quarts to 1 gallon at each injection. Injections were usually given twice daily. (4) In one case of phthisis the effects of the gas were entirely negative. (5) The value of the gas seems to be that of a useful therapeutic measure, rather than a curative plan of treatment. (6) The method of preparing the gas for use in the hospital consists in passing the carbonic acid gas through a solution of chloride of sodium and sulphide of sodium in 22 ounces of water. In July, some few months later, Dr. Bruen⁵⁹ stated that he considered the treatment chiefly valuable in those cases of pulmonary disease attended with bronchial catarrh: “Our efforts in the therapeutics of phthisis should be directed rather to those measures which tend to establish the general health than to hunt up specific forms of treatment. Suitable climatic conditions and judicious alimentation, and appropriate personal hygiene remain in my opinion the first principles in the therapeutic management of phthisis; and Bergeon’s treatment should be considered an adjunct.”

Dr. H. C. Wood⁴⁹ cured a case of catarrhal pneumonia with an enormous amount of purulent expectoration; a case of asthma with chronic catarrh and emphysema was much improved; a case of pleurisy complicated by bronchial pneumonia had been under his care for 3 months without improvement, but yielded to this treatment in 15 days. He considers it of the greatest importance to fix definitely the dose of H_2S , and believes that taking the H_2S water by the mouth produces as good results as the injection per rectum. His method of administering by the mouth is as follows: at first a half ounce, afterwards an ounce of the saturated solution of H_2S should be placed in a tumbler and 2 or 3 ounces of carbonic acid be run into it from a highly charged siphon, the whole being drunk while effervescing. This preparation may be given 3 to 5 times a day, so that the patient will receive daily between half a pint and a pint of the H_2S .

In the Hartford Free Dispensary gaseous enemata were used for three months. Dr. M. M. Johnson²⁹ says that within the first week night sweats ceased, patients coughed less and raised easily, appetite improved, and quiet sleep was obtained. The improvement was more marked than by any other treatment he ever used. Asthmatic cases yielded very quickly, in some cases the attacks ceasing at once. An improvement in dispensary patients who live under bad sanitary conditions, especially in the months of February and March, speaks well for the treatment, which seldom gave pain or inconvenience. Dr. A. Gaston Boeth,³⁹ of Boston, found in his treatment of 10 cases that at the end of the month there was increase of weight in 6, diminished weight in 2, the same weight in 1, and no record in the other; in all, the pulse, temperature, respiration, appetite and expectoration were improved; in 9 the night sweats were stopped; in all, the number of bacilli was diminished. Francis P. Kinnicut,³⁹ of New York, treated 9 cases. Temperature was diminished in 5 of these, there was gain of weight in 4, loss in 1, no effect in 3; appetite improved in all; amount of sputum diminished in all but 1; night sweats ceased in all, but physical signs were not affected. Dr. Coghill,¹⁹ of the Isle of Wight, has used the method with the most encouraging results, and considers it by far the greatest advance in the therapeutics of pulmonary phthisis. J. H. Parkinson,⁶⁰ of California, has had most gratifying results. In one case the patient gained 6 pounds in 3 weeks, slept and ate well, while the cough and expectoration were greatly diminished. The expectoration steadily lost its purulent character. This patient had been treated by him for 17 months without benefit from any other measures tried. Dr. J. Solis Cohen says that he does not hesitate to express his opinion of its value as a therapeutic measure. Some of his patients did well, and one of them insisted that she was well, though she was not. Dr. Parker,⁶¹ of Texas, says the method has done more in his hands than any thing else he has known. Lamallerée²⁷ states that he was unable to inoculate chickens with tuberculosis from the sputa of a patient under the Bergeon treatment, though he had been able to do so before. Dr. F. P. Henry⁶² observed a gain in the body weight of each of 8 patients treated by the method in the Episcopal Hospital, Philadelphia. Dr. M. Singer,⁶³ Texas, treated successfully 3 cases of pulmonary trouble of a chronic nature.

The Chicago Medical Society,¹¹ at a meeting in April, expressed almost unanimous approval of the method. Dr. Owen Pritchard⁴ concludes, from his results in two cases, that even if a positive cure is not obtained the progress of the disease is greatly retarded, and its most trying symptoms are almost entirely removed. Dr. J. Burney Yeo⁴ has observed a gain of flesh and strength and general amelioration, with fall of pulse, temperature and respiration, and diminished expectoration. Rest at night has been improved. Dr. Parham,⁶⁴ of New Orleans, after employing the Bergeon method in a series of cases, feels warranted in saying that it is of value, but that the cases should be selected.

German physicians have shown their customary reserve in the adoption of expedients whose utility is not based upon the soundest pathological grounds. Statz⁵⁹ recently reported cases from Fräntzel's clinic in which the treatment was thoroughly tried for periods ranging from 9 days to 16 weeks. In 6, the physical signs were improved. In all, general palliation ensued, but in none were the bacilli diminished. The improvement in appetite and weight were lost as soon as treatment was suspended. Further trial was urged by Statz; but in the discussion Ewald stated that he could not see any ground for placing reliance upon the method. Dr. Wyss,⁶⁵ of Geneva, after long experimentation and close observation, thinks it very questionable whether it will prove of positive therapeutic value. Perret,²⁴ of Lyons, has found that the rectal injections do not possess any microbicidal action; they modify the bronchitic phenomena and diminish expectoration; they react on nutrition, especially in the apyretic forms, the same as other medicaments. His experiments were made on 18 cases. Pepper and Griffith⁵⁹ tested the method in 24 cases, in none of which was the temperature brought down to a continuously normal condition. The occasional increase in weight was, in their opinion, probably due to complete rest and good food. Improvement of cough was not so marked as of weight. In the majority of cases there was no perceptible diminution of expectoration. It is extremely doubtful whether there was any decrease in the absolute quantity of bacilli in the sputum. Night sweats were unimproved in the majority, and physical signs were not improved. They conclude that the treatment has had undue value attached to it, and that it is seldom of real benefit, though it may prove serviceable in occasional cases.

Henry Jackson and F. Shattuck⁵⁹ treated 6 cases of phthisis and 1 of chronic bronchitis, with emphysema and asthma. Their conclusions are as follow: Toxic symptoms such as nausea, vomiting, general depression or collapse, diarrhœa and headache may follow the injections. (2) They are apt to cause abdominal discomfort. (3) The remedy is in no sense a specific for phthisis; if useful, it is only as an auxiliary to older and generally accepted methods. (4) The only benefit seen was diminution in the amount of expectoration. Dr. Geo. D. Hays¹ also says that its only influence is on the suppurative tendency, and that in this instance empiricism has outrun science. Whatever may be its future, we cannot afford to deny it a fair trial. J. B. Hirschfelder,⁵⁶ after treating 15 cases, says that the results do not warrant the extravagant praise accorded to it. Dr. Herron,¹⁹ of London, has not seen a single instance in which there was the slightest permanent benefit in any of the cases treated under his supervision. Dr. V. G. Mears, Fon du Lac, Wis., treated 8 cases. There was great pain in all and only temporary improvement in 2 cases. O. T. Schulz⁶⁶ says the method yields no better results than many physicians have obtained from the internal administration of sulphur preparations.

J. Henry Bennet⁶⁷ claims that he has repeatedly witnessed the complete absorption and expulsion through the lungs and mouth of all the gas injected by the rectum, and that within half an hour after cessation of the injection. The use of enemata has been entirely abandoned in the fourth division, Bellevue Hospital, where they have been earliest and longest tried.⁶⁸ Dr. E. L. Trudeau⁵⁹ has proved by experiments on animals that the method has no antimicrobial value whatever. The Journal of the American Medical Association says: "Though the treatment may prove in the future to be a useful therapeutic measure, there is not the least warrant for the assumption that a specific for tuberculosis has been found."

Finally, the *Medical and Surgical Reporter* says: "While Bergeon's method cannot be expected to fulfill the hopes which it first aroused, it is not to be regarded as worthless. It seems to have some power to check profuse catarrh of the bronchial tubes and so free the patient from part of the cause of cough. Occasionally it may seem to set a patient fairly on the road to recovery."

In summing up the year's work in regard to the treatment, the weight of evidence seems to prove the following points: (1) That usually there is diminution in the severity of the symptoms and improvement in the general condition of the patient. (2) That the H_2S is not exhaled by the lungs, nor does it have any anti-mycotic effect. (3) That inhalations of vapors of sulphurous waters as recommended by Niepce, or the administration of H_2S by the mouth, have an equal effect, and produce all the other good effects of gaseous enemata. (4) That the agent effects its good by addressing the soil rather than the seed of the disease, and that it is therefore in no sense a specific; but that in relief or palliation of the *tout ensemble* of symptoms it is more effective than any other single agent that we possess.

Pneumato-Therapy.—Dr. Solomon Solis Cohen considers the pneumatic cabinet the most available, most manageable and on the whole, the most beneficial method of applying this treatment. Dr. H. A. Johnson¹¹ states that any physician who has a spray tube and a glass vessel with two openings, a Wolffe bottle, or even an ordinary wide-mouthed bottle, can provide himself with an apparatus just as useful as the pneumatic cabinet. By the use of a thin way stop-cock, expiration may be made into a tank of compressed or rarified air, against a valve supported by a spring of any desired pressure, or through a narrow opening so as to regain force to expel the air from the chest. All these methods have been used to accomplish the same result as expiration from the cabinet into outside air.

Two cases reported by Dr. William C. Wood¹ bring out some points of practical value in pneumatic differentiation. It would seem that forced inspiration must be employed with caution and cannot be used alone either long at one time or many times repeated with the hope of increasing benefit; and that the maximum gain will be reached after a very few treatments of short duration under a vacuum of from $\frac{2}{10}$ to $\frac{8}{10}$ of an inch.

Inhalants.—Hua and Breuere⁵⁹ call attention to their observations that phthisical workmen employed where they inhaled the fumes of boiling solutions of picric acid were much benefited. They also report cases greatly improved by this treatment. Rabbits inoculated with tuberculous matter were favorably influenced by picric acid fumes.

Bacterium Thermo.—Dr. T. Stachinoviez,⁴² House Physician in Dr. Bremer's hospitals for phthysical patients in Goerbersdorf, draws the following conclusions from experiments made by him: (1) The inhalations do not manifest any decided influence either upon the febrile temperature or on the number of Koch's rods in the sputa. (2) They do not arrest the progressive loss of body weight. (3) They invariably produce unpleasant taste in the mouth, nausea, vomiting and gastric pain. (4) They cause loss of appetite and aversion to food. Dr. Filopovitch²⁷ demonstrated to the Odessa Medical Society that there was no diminution in the sputum, no influence upon temperature, perspiration nor body weight; in short, no good whatever from the treatment.

Sulphur.—Dr. René Serrand⁶⁹ thinks inhalations of sulphur the very best remedy. He claims that they cure chronic affections of the respiratory organs, especially apyretical phthisis. Hæmoptysis is not a contra-indication. The vapors are valuable in respiratory paresis in patients with narrow chests and in those predisposed to pulmonary tuberculosis. The graduated inhalation revives the vesicular murmur, clears up the dullness and restores sub-clavicular elasticity. The inspiration becomes easier and deeper. Too prolonged inhalation may produce acceleration of the heart, cerebral excitation, vertigo and insomnia. The quantity of gas inhaled, its temperature, humidity and "sulphuration" should be adapted to the pathological condition of the individual. Prof. Fribault, of Toulouse, has constructed an apparatus for the purpose. Dr. Ley⁶⁹ has tried inhalations of anhydrous sulphuric acid in several cases, and notes decrease in cough and expectoration, increase of appetite and return of sleep. He burns 6 grams of sulphur per cubic metre of space in close room, daily for three days, the chamber being first thoroughly aired. Patients enter room 10 to 12 hours after the sulphur has been burned.

Dr. Sollard³⁹ reports the radical cure of a case of phthisis by a long sojourn in a sulphurous atmosphere. His method is to confine his patient for 8 hours in a close room in which 12 hours before a quantity of sublimed sulphur has been burned, equal to 10 to 20 grams per cubic metre. There is no irritation, no increased coughing, and no hæmoptysis from this method of treatment. Balboud, of Cherbourg, has tried it in 8 cases, with much improvement after four months, though there was no noticeable diminu-

tion in the bacilli of the sputa. Auriol, of Bellegarde du Garde, has tried it in 70 cases, with some cures and amelioration in all of the cases. Dujardin-Beaumetz states that under this treatment there is a speedy change in the sputa, the cough diminishes, the patients sleep much better and have a much better appetite.

Oxygen.—Dr. Richardson⁷⁰ writes: “Ethereal oxygen is a compound I have recently invented for inhalation. I place in a Wolff’s bottle with an inhaling mouth-piece attached to one neck, two ounces or more of zonic ether, the ethereal solution of the peroxide of hydrogen. To this I add gradually solution of permanganate of potassa—eight grains to one ounce of water—by the other neck of the bottle, and then cock that neck. As the fluids commingle oxygen gas and ether vapor are given off freely and can be inhaled from the mouth-piece. The compound of gas and vapor, anæsthetic, antispasmodic and respirating, is applicable to a large class of cases of disease, such as pertussis, asthma and phthisis.”

Eucalyptol.—Bouveret and Pécharde²⁴ have tried the subcutaneous injection of eucalyptol, and state as their results that it does not arrest or even delay the development of bacilli, prevent fever or the spread of the disease, either in the lungs or in the system. It probably exerts a favorable influence on the secretions of the mucous membrane. Seven cases derived no benefit whatever, while 10 apyretic cases were most benefited. Prof. Ball⁴⁸ treated 21 patients in this manner, 6 of whom died, 10 improved somewhat. There was cessation of night sweats, and diminution of diarrhœa and expectoration. Lefaiivre⁴⁸ reports marked improvement in 4 cases in different stages of the disease. Dr. Cenas⁴² claims that with this method the cough becomes less frequent, the breathing freer, and the pseudo-asthmatic attacks less severe. The expectoration is modified in quality and quantity and finally consists of mucus only. In from 10 to 20 days the stethoscopic signs will have disappeared, the appetite will have returned and the general condition improved. It should not be used at all in febrile conditions, and if no improvement occurs in 10 or 15 days, the treatment should be discontinued.

Pilocarpine.—This well-known alkaloid is experiencing the fate which has befallen so many agents introduced with too laudatory statements. It does, however, undoubtedly increase the

secretion from the bronchial mucous membrane, and in cases of dyspnoea of a paroxysmal character, its action is often remarkably prompt. In a prolonged experience, Riess⁵⁹ has not seen any dangerous results, though vomiting sometimes occurs after the third dose. He recommends $\frac{3}{8}$ of a grain daily by hypodermic injection; for children and old people, half this dose.

Hydrofluoric Acid.—M. Garcin,¹ of Paris, recommended to the Academy of Medicine the placing of phthisical patients for an hour every day in a small cabinet containing six cubic metres of air saturated with hydrofluoric acid. This saturation is obtained by pumping a current of air through a gutta percha bottle containing 100 grams of the acid to 300 grams of distilled water. The quantity of air pumped in is renewed every fifteen minutes. 100 patients were treated during the month of August by this method. 14 remained in the same condition, 41 were improved, and 35 were cured, while 10 died. The attacks of cough diminished and finally ceased. The Koch bacillus at first diminished in number, soon no longer segmented, and finally disappeared from the secretions. The general state of the patients was much improved, appetite was increased, night sweats ceased, and some patients treated over a year ago remain well.

Bisulphide of Carbon.—Don Jaime Estape⁷¹ gave the bisulphide of carbon in a case of bronchiectasis. Twenty-five grams, together with thirty drops essence of peppermint, were put into a wine bottle full of water; of this a tablespoonful in milk was given every four hours; after each dose the bottle was refilled with water: no alcohol was allowed. In two months the man was again able to do heavy manual work, his general condition was improved, cough and expectoration greatly diminished.

Antipyrine.—According to Dr. Zakrzhevski,⁷ this drug is almost a specific in phthisis. "While the mortality under ordinary methods of treatment in the Helsingfors Hospital was 50 per cent., during the eight months in which the antipyrine treatment has been carried out not a single case has proved fatal, many of the patients having, on the contrary, improved so decidedly as to be able to return to their homes." The author much prefers the hypodermic method of administering antipyrine, as the effect is produced in less than one hour; whereas when the drug is given by the mouth no effect is produced for from one to three hours. Antipyrine

increases the force of cardiac contractions and so raises the blood pressure. In phthisical patients it shows the pulse, but never quite to the normal rate. It also slows and deepens the respirations, and the digestive functions were improved. No sign of renal disturbance was observed. The dose must be regulated by the strength of the patient, varying from 10 to 90 grains.

Tannin.—The tannin treatment of tuberculosis followed closely the introduction of the detailed work of Bergeon. Drs. Arthaud and Raymond²⁷ are reported to have obtained remarkable results in Paris. Tannin was given in doses of 30 to 60 grains a day and improvement was visible in a fortnight. They consider tannin preferable to sulphide of carbon or iodoform, offering greater resistance to the tubercular virus.

Aniline.—A Russian commission⁴ has concluded that the aniline treatment, as proposed by Kremianski, has no value in phthisis. Nesterhoff tried it on a patient about to be sent South, with the result that he became rapidly worse and died.

Borax.—Feroglio,⁵⁹ of Cagliari, treated five cases of phthisis with inhalations of compressed air laden with finely powdered, carefully dried borax. Improvement of all the symptoms was observed within fifteen days.

Turpentine.—Prevost³¹ recommends that to introduce this drug into the system without disturbing the digestion, the patient be placed in an apparatus so arranged that the body is immersed in turpentine vapor whilst the head is protected from it. The passage of turpentine through the skin can be shown by its presence in the urine and respiration. He gives notes of two patients thus treated, in whom the general condition improved considerably, the body weight increased, and the lung symptoms were ameliorated.

Phosphate of Copper.—Luton⁷² recommends this treatment hypodermically in the earlier stages of the affection. Copper acetate with bismuth subnitrate or lime water, is well borne by children. The initial dose is 1 centigram daily, gradually increased to 3 doses per day. For an adult he advises about $\frac{1}{6}$ of a grain of acetate of copper with 1 grain of carbonate of soda in a pill, taken night and morning upon an empty stomach.

Iodoide of Sodium.—Lépine²⁷ reports a case treated with this drug (10 to 15 grams daily) which terminated fatally; but no

fresh tubercles were found at the autopsy,—a fact upon which the lays great stress, attributing it to the action of the liberated iodine.

Naphtha.—Scherbakoff⁷³ obtained favorable results from the use of naphtha; but as this was not easily obtained in a pure form, he substituted benzine with like good results. The patient is required to inhale the naphtha 5 minutes every hour of the day, the dose being 120 grams a day.

Antifebrine.—The same author considers this drug an excellent antipyretic in phthisis. The lowering of the temperature does not appear to influence the local process in the lungs. Antifebrine is also highly recommended by Charles Caldwell.⁶⁸

Pond,⁵⁶ of St. Helena, Cal., reports the case of a patient cured by inhalations of creosote and intra-pulmonary injections of iodine.

Night Sweats.—Rebory¹⁹ has found the phosphate of lime of especial benefit in the night sweats of phthisis, though its mode of action is obscure. It is easily administered, well borne by the stomach, prevents diarrhœa and stimulates nutrition. Hare⁷⁹ recommends bile salts and cod-liver oil inunctions. The former aid in the passage of fats through animal membrane, while there is no irritation or fatigue from the excessive rubbing necessary when they are not useful. Dr. Armistead Peter,⁷⁴ of Washington, D. C., gives 5 gr. of pulv. agaric every 2 hours (for 3 doses) if necessary and finds it acts almost as a specific, in sweating. A. L. Hodgdon, of Farmwell, Va., has found that 30 drops of the fluid ext. ergot controlled diarrhœa, and that 20 drops of the same given three times in 24 hours relieved diarrhœa and ameliorated the sweating of phthisis.

Hæmoptysis.—Hausmann⁷⁵ advises atropine hypodermically in desperate cases of hæmoptysis when other methods have failed. He reports three cases in which $\frac{1}{25}$ of a grain of sulphate of atropia was injected with no recurrence.

Climatic Treatment.—O. P. Davy,⁷⁶ of Cincinnati, believes that the nearest approach to perfect immunity from tuberculosis is to be found on high mountains, where, on account of extreme thinness and accompanying dryness of the air, the tubercular organism cannot exist. Dr. James Blake,¹⁹ of London, reports that while living in the open air consumptives invariably improved, gaining in weight from four to twelve pounds, but when in their houses during the winter they all lost weight. He believes that

this is due to an action in the nervous system; for it is evident that if in two or three minutes after putting one's feet into cold slippers, one should find the blood-vessels of the Schneiderian membrane distended, this can only be through some change produced by the cold on the vaso-motor centre. It is probable that all the mucous membranes of the body are simultaneously affected to a greater or less extent. The *Lancet* says editorially that cases of hæmorrhagic phthisis, in which the hæmorrhages are profuse and the physical signs slight, are favorable for high altitude treatment, senile change, gout, rheumatism and weak circulation, and contra-indications.

Dietetics.—Dr. Loomis⁶⁷ thus formulates the dietetic of phthisis: "Take food not less than six times in 24 hours. Three full meals at intervals of 6 hours with light lunches between. No more food at one time than can be easily digested. Take no food when suffering from fatigue, worry or excitement. The articles of any one meal should be such as are digested in either the stomach or intestine alone; *i.e.*, the fats, starches and sugars should not be mixed with the albuminoids, and the meals should alternate in this respect." Dr. L. Huber,⁶ of Kansas, advises the use of alcohol early in the disease, and considers that if the appetite improves, cough and expectoration lesion and respiration is slower and deeper under its use, no better agent can be found for that particular case.

Surgical Treatment of Pulmonary Cavities.—Dr. Rickman J. Godlee¹⁹ stated that the surgical treatment of pulmonary cavities was still in its infancy, and that while in certain classes of cases it will advance in efficiency, the treatment of others will probably be handed over altogether to physicians. Those in which surgery has been or may be attempted may be classified as follow: (1) tubercular cavities; (2) cavities resulting from gangrene of the lung; (3) cavities resulting from bursting into the lung of abscesses or other collections of irritating matters from without; (4) bronchiectases, from whatever cause, including those dependent upon foreign bodies in the air-passages.

Dr. Arthur Neve⁴ records the case of a young man with cavities in the upper and anterior part of the right lung, in which after resection of a rib, he introduced large sized drainage-tubes. The cavities which were opened and those higher up in the apex

ceased to secrete and apparently cicatrized. In this they were assisted, not only by the drainage and the topical applications (eucalyptus and creosote), but also by the partial removal of the rib, with the consequent possibility of retraction of the thoracic wall. Inspiratory efforts will effectually distribute antiseptic applications, such as iodoform, eucalyptus, etc., to subjacent portions of the lung, and their effect may be kept up by the use of volatile antiseptics in the dressings used. The reporter uses large pads of cedar sawdust to which he adds creosote, etc. These act as respirators, filtering and warming the air before it reaches the pulmonary tissues.

De Bearman and Pengreuber⁶⁴ operated upon a child 12 years of age for cavity in middle of right lung. The thermo-cautery was passed into the cavity through the opening made by excising a piece of rib; much fetid matter escaped; a drainage-tube was inserted and wound dressed with iodoform. The wound progressed satisfactorily and had nearly healed in three weeks. Patient died shortly afterwards.

Thiriart²⁷ relates a case of pneumotomy in empyema communicating with cavity in the lung. A flap 5 by 8 inches was dissected off 3 fingers breadth from right side of vertebral column; portions of fifth, sixth, seventh and eighth ribs were excised; costal pleura was found united with pulmonary. Thermo-cautery was used, pus escaping. The cavity was washed out with a solution of mercuric bichloride (1-1000); drainage-tubes and aseptic dressings were used, and the patient was cured in a few weeks.

DISTOMA PULMONALE.

Our Corresponding Editor, Dr. H. T. Whitney, of Foochow, China, sends us the following very interesting report, which we incorporate bodily:—

The distoma pulmonale has been recognized in the East since 1879, usually in connection with a certain form of hæmoptysis. It was almost simultaneously written about by Prof. Bælz, of Tokio, Japan, and Dr. Patrick Manson, of Amoy, China. Since then Dr. Wallace Taylor, of Osaka, Japan, has written upon the subject, and from his article we quote the following description of a distoma observed by him:—

“The length is from 8 to 10 mm., and the breadth from 5 to

6 mm. The form is oval, with oval and caudal extremity. The extremities are fully rounded, and the caudal broader than the oval. With a lower power the outline appears obtusely crenated, being made up of articulated rings like an earth-worm. Locomotion is effected as by the leech. In the fresh state the color is a reddish-brown, but after remaining in alcohol for a time the specimens become matted. A transverse section approaches a circle. There are two suckers, oval and ventral. The alimentary canal is bifurcated shortly behind the mouth, with the single opening in the oval sucker, and ending in blind extremities. The parasite is hermaphrodite, the genital pore opening between the suckers, and with the reproductive organs situated around the bifurcation of the alimentary canal. The branched motor-vascular system opens at caudal extremity. The ova are ovate, sometimes almost oval. The length is from $\frac{1}{13}$ to $\frac{1}{10}$ mm., and the breadth from $\frac{1}{20}$ to $\frac{1}{17}$ mm. They are of an amber color, sometimes pigmented, with an external testa and operculum at the broader extremity.

“*Discovery and Origin.*—In Formosa it was first noticed by Dr. B. S. Ringer, of Tamsui, in the lung of a Portuguese, June, 1879; in Japan by Prof. Bætz, of Tokio, and in China proper by Dr. P. Manson, of Amoy, in April, 1880. It is probable that to Prof. Bætz belongs the “merit of priority” of discovery. Dr. W. Taylor, from his observations in Japan, is of the opinion that snails are the ‘intermediate host’ of this entozoon; that the ova of the distoma are conveyed by the snail to the ditches and infect the water, and through the use of this water, either by drinking it or washing vegetables in it and eating them raw, the distoma is conveyed into the human system. He found ova in the fæces which are also used to fertilize the fields,—another way of infecting the water. It is probable, however, that there are other intermedia for the distoma, as in many places where the disease prevails the presence of snails is hardly known. Dr. Taylor’s observations were near the sea where snails were numerous; but the disease occurs hundreds of miles inland where snails are unknown.

“*Distribution.*—It is now quite evident that this distoma is more or less prevalent in Japan, Corea, Formosa, and in Northern, Central and Southern China. It seems to be much more prevalent in certain localities than others. It is found in both sexes and all

ages. In Japan Dr. Taylor found it the most frequent in children, next in women, but this was explained by the fact that children played near the ditches and probably drank oftener of the ditch water. In other places it is found most commonly from the beginning to the middle of adult life of men. This also accords with my own observation.

“*Morbid Anatomy*.—Dr. Taylor mentions four post-mortems in different parts of Japan. The external appearance of the lungs was little if any changed. The parasites were found in the smaller bronchi and lung tissue. Their burrows were about the size of a filbert, and frequently communicated with each other, and always with the smaller bronchi; sometimes by several openings. The bronchus presented the appearance of a sac-like dilatation on one side. Each of these dilatations or cavities was surrounded by an irregular indurated ring extending into the lung tissue farther in some places than others. The adjacent bronchi were more or less congested or inflamed and the circumjacent lung tissue congested. The cavities contained broken down lung tissue, hæmatoidin, ova, and *débris*. The contents of these cavities mixed with mucous secretion formed the characteristic sputa.

“The irritation from the presence of the parasite is the evident cause of the increased bronchial secretion and large expectoration. The cause of the hæmorrhage, however, which is arterial, is not so clear. But it is probable that the parasite attaches itself to the mucous surface of the bronchi by its suckers, and when it releases its hold, slight oozing of blood follows, producing pellets of blood in the sputa, while the larger hæmorrhages are probably caused by a rupture of capillaries or small arteries.

“Prof. Baelz explains the bleeding by the passage of the larvæ from the circulation to the bronchi. Hæmorrhage, however, does not always occur, and in such cases the sputa is smoky or rusty even when in large quantity.—like the rust sputa of pneumonia. Frequent or large hæmorrhages are exceptional.

“*Symptoms and Course*.—The symptoms are often mild. At first a slight cough and sometimes discolored sputa. This may occur once or twice a day or several times, or during one day only. It may continue a week or so and then cease for a time. The expectoration and cough increase together. As the disease progresses the intervals become shorter and the periods of coughing

and expectoration continue longer, till finally the sputa may become regularly bloody and be produced any time voluntarily. The amount of sputa is usually small, but may suddenly increase to 10 or 15 ozs. in a few hours. Frequent large hæmorrhages rapidly reduce the patient, but otherwise he may go on 5, 10 or even 20 years without serious detriment. There seems to be no regular periodicity of hæmorrhage. It may occur about once in 6 months, or once a year, or even at longer intervals. In bad cases respiration tends to a bronchial character, temperature is normal or slightly elevated; there is a sense of heat and oppression in the chest, dyspnœa on slight exertion, anæmia, œdema, great exhaustion from coughing and hæmorrhage, pains about the chest. After a hæmorrhage a time spent in bed causes an abatement of symptoms and there is apparent recovery, except the coughing and expectoration; but sooner or later hæmorrhage is likely to recur, and gradually the patient is worn out. Violent exercise, singing or speaking in the open air or to large crowds, tends to bring on a hæmorrhage.

“Treatment.—No drugs have yet been found to produce a curative effect. Quassia, kousso, turpentine, santonine, sulphur, etc., have been used either by mouth or inhalation, but to little or no effect. The object of this kind of treatment is antiparasitic; but very little can be hoped from it if we consider the nature and habitat of the parasite. Patients under like conditions have improved without and with the use of medicine. Remedies, however, should be employed for the general improvement of the patient.

“Quinine, iron, cod-liver oil, or milder tonics, with expectorants, and stimulants in the most cases, have been given with very good results; and these in connection with good food and proper rest are mainly to be relied upon. The prophylactic is the most rational treatment. Water is no doubt the common medium by which this parasite is conveyed into the system, as in enteric fever, etc. Drinking water should always be bailed and filtered, milk should be scalded, and all vegetables and greens to be eaten raw should be thoroughly cleansed with bailed water.

“This report has been compiled from Dr. Wallace Taylor’s articles as a base, including the substance of my own observations and those of Mr. Manson and others.”

REFERENCES.

1. N. Y. Med. Jour. 2. Gaz. des Hôpitaux. 3. Vratsch. 4. Lancet. 5. Phila. Med. Times. 6. Med. and Surg. Rep. 7. Lancet. 8. Gaillard's Med. Jour. 9. N. Y. Med. Jour. 10. Am. Clin. Soc., 1886. 11. Jour. Am. Med. Assoc. 12. Med. Standard. 13. Jour. Am. Med. Assoc. 14. St. Louis Courier-Rec. 15. Jour. Am. Med. Assoc. 16. Prager Med. Woch. 17. La Normandie Méd. 18. Brit. Med. Jour., 1883-6. 19. Brit. Med. Jour. 20. Kansas City Med. Index. 21. Canadian Pract. 22. La France Méd. 23. Cent. f. Chir. 24. Lyon Méd. 25. Edinburgh Med. Jour. 26. Berlin klin. Woch. 27. La Semaine Méd. 28. Am. Lancet. 29. Med. Register. 30. Trans. N. Y. Acad. Med. 31. Med. Chronicle. 32. Med. Bulletin. 33. Gaz. Heb. des Sci. Méd., Bordeaux. 34. Provincial Med. Jour. 35. Deut. Med. Woch. 36. Revue de Méd. 37. Jour. de Méd. de Bordeaux. 38. Glasgow Med. Jour. 39. Boston M. and S. Jour. 40. Cent. f. klin. Med. 41. Gaz. Méd. de Strasbourg. 42. London Med. Rec. 43. Arch. of Pediatrics. 44. Med. Press and Circular. 45. Deut. Med. Zeit. 46. Am. Jour. Med. Sci. 47. Canada Med. Rec. 48. l'Union Méd. 49. Therapeutie Gaz. 50. Weekly Med. Review. 51. Zeit. f. klin. Med. 52. Allg. Wien. Med. Zeit. 53. Notes on the History of Contagion from Phthisis. 54. Coll. and Clin. Rec. 55. Le Progrès Méd. 56. Pacific M. and S. Jour. 57. La Clinique. 58. Handbook of Geographical and Historical Pathology, vol. iii. 59. Med. News. 60. Sacramento Med. Times. 61. Daniel's Texas Med. Jour. 62. Polyclinic. 63. Texas Courier-Rec. 64. New Orleans M. and S. Jour. 65. Fortschr. der Med. 66. Am. Pract. and News. 67. Am. Med. Digest. 68. Med. Record. 69. Jour. de Méd. de Paris. 70. Asclepiad. 71. Revista di Cencias Med. 72. l'Union Méd. et Sci. Nord-est. 73. Revue des Sci. Méd. 74. Maryland Med. Jour. 75. Revue Gén. de Clin. et de Thér. 76. Cinn. Lancet-Clin.

[Undated references apply to journals published in 1887, and original articles can be found by consulting the indexes of the respective publications.]

INEBRIETY, MORPHINISM AND KINDRED DISEASES.

By HENRY M. LYMAN, M.D.,

CHICAGO.

INEBRIETY.

THE attention of the medical profession has been directed, during the past year, to the subject of inebriety by numerous papers that have appeared in the journals, and, notably, by the proceedings of the First Colonial and International Congress on Inebriety,¹ which met in London, July 6th, 1887, followed Sept. 9th, 10th and 11th by the Second International Congress² in opposition to the abuse of alcoholic beverages, held in Zurich, Switzerland.

One of the most valuable contributions to the natural history of inebriety is furnished by Alfred Tourdot,³ who has made a most exhaustive study of the habits of the laboring population of Normandy. The following extract will present a most instructive picture of the life of degradation into which those poor people are plunged:—

“The tavern opens its doors at half-past four in the morning, in summer, and at five o'clock in the winter. It is generally full at the end of half an hour. First come the common laborers who take one or two little glasses of gin, and then repair to their tasks. Then come the longshoremen, who call for one or two *quarante* (small glasses of brandy, at two francs a litre, containing the twentieth part of a litre) whenever they have managed to save six sous from the outlay of the previous evening. To the first class of customers brandy is served in glasses *à la Renache*, that is to say, in glasses that are very thick and running down to a point at the bottom. The later comers do not permit such imposition; they get angry and demand their money's worth, declaring that glasses *à la Renache* are only fit for lazy folks. If they have but a single penny, they content themselves accordingly. Some indulge in the luxury of *fochsiné*, a species of brandy, at two francs and

a half per litre, which differs from the rest only in its greater alcoholic strength. It is well known that the majority of drunkards medicate themselves with brandy for nearly all the numerous ailments with which the morning finds them afflicted. They come tottering and staggering to the tavern, tormented with headache, with gastric colic, with parched throats, pallid, half awake, every part of their bodies filled with pain. At half past six o'clock they go to hire themselves for the labor of the day. Often they receive an advance of fifty centimes on their wages, and then the tavern is filled a second time at seven o'clock. This time they take a sou's worth of coffee with two of brandy, even doubling or tripling this ration. At the bar the usual formula is *un deux*; that is, one sou's worth of coffee and two of brandy.

"About half the workmen again resort, for ten minutes, between nine o'clock and half past ten, to the tavern, where they treat themselves once more to coffee and brandy. They linger but a short time, because this is a busy portion of the day. At noon all who work by the hour receive a franc. Of this from four to seven sous are spent for food; the rest goes for coffee and especially for alcohol. Between one and two o'clock the den is emptied, but between half past three and four o'clock the men receive ten sous each, and again they take up the line of march to the zinc-covered counter. There they take a good strong cup of coffee, *well fortified*, and then resume their monotonous labor till the close of the day. At that time some of them take one or more doses of *aperient*, or *bitters*, or *vermouth*, *absinthe*, *phonsot*, etc. (*Phonsot* is the name derived from Alphonse, the name of the dealer; its taste reminds one of bitters, but it is more acrid, and, especially, more alcoholic; it is made by the addition of certain chemicals to alcohol. It is sold at three sous for a small glass, and is prepared by the thousand litres at a time.)

"Supper, like the breakfast, is reduced to its simplest expression. Between the hours of six and eight in the evening the utmost animation and a devouring activity reign throughout the place. The workmen (*suns*, as they call themselves) have a little money, and the different varieties of drink appear and disappear as if by enchantment. It is a curious spectacle to see them lift the glass to their lips, swallow it down at one gulp and finish the operation with a little shake of the head, sign of blissful satisfac-

tion. Later in the evening they empty their glasses less rapidly, and seek to prolong their pleasures; about once every half hour they call for a fresh draught.

“On certain days the crowd is greater than usual, particularly on the festival of the patron saint of the tavernkeeper, or of his son. Every client then receives a gift of four sous. On New Year’s day every one present is served free with a glass of liquor, which, however, does not prevent the dealer from making a profit of about eight hundred francs that day. On the day of the Epiphany there is distributed to each customer, *according to his merits*, half a litre of brandy, a litre of rum or of cognac, or even sometimes a jar of prunes soaked in brandy. On such occasions the crowding is indescribable; the people climb on each other’s shoulders. During the evening and at night the streets are filled with persons of both sexes, clinging with one hand to a railing or other support, while with the other they lift the bottle to the mouth; often, too, they exhaust themselves in the effort to vomit. In the laborers’ drink-shops it is seldom that one may not see, at night, seven or eight beastly drunken women, never speaking, fixed like statues in the corner, the most intoxicated ones held up by the others, reaching from time to time after a glass of brandy at the bar, and occasionally ejaculating the words: *Sapristi quelle saleté! Encore un verre!*”

That this shocking picture presents nothing uncommon, is shown by the Report of the Ministry of Finance that there is a tavern to every ninety-five of the inhabitants throughout France, an increase of more than 11 per cent. within the last six years. A recent report, made by an investigating committee of the French Senate,⁵ declares that in France there are 430,000 shops for the sale of liquor, 30,000 being in Paris alone. It is further estimated that the French people consume in a year, sixteen billion glasses of alcohol, each glass costing two sous. This means one billion six hundred million francs taken from the wages of workmen for a drink that is absolutely poisonous in nine-tenths of the cases in which it is used. A similar increase in the use of alcoholic drinks is reported from Belgium, Austria, Switzerland and Germany. But the worst evil growing out of this consumption is caused by the frightful deterioration of the beverages that are furnished to the mass of the population.⁶ These drinks

contain very little pure alcohol, but are reinforced with poisonous products of the distillation of apples, pears, blasted potatoes, and musty grain. Liquors thus prepared burn the throat like fire. The Belgian laborer is said to invigorate his dram by the addition of a few drops of sulphuric acid. They contain aldehyde, propylic alcohol, traces of amyllic and butylic alcohols, and a substance called furfurol. This last is found in alcohol distilled from grain, and is yielded as a colorless liquid that rapidly turns brown on exposure to the air; its odor reminds one at the same time of both the oil of cinnamon and the oil of bitter almonds. Administered to animals in doses of a few cubic centimetres, it quickly produces tetanic symptoms, epileptic convulsions, and arrest of respiration.

The additional dangers connected with the use of such liquors are well illustrated by the recent experiments of M. Alglave.⁷ According to this chemist, "to poison an animal with pure ethylic alcohol requires as many times seven grams, seventy-five centigrams, as there are kilograms in its weight; whereas, with pure amyllic alcohol, it would not take more than one gram, ten centigrams, per kilogram. In other words, supposing a man to weigh eighty kilograms, it would require six hundred and twenty grams of ethylic alcohol to kill him, while with amyllic alcohol it would take only eighty-eight grams."

The effect of alcoholic poisoning is, of course, ordinarily produced by the habitual drinking of alcoholic beverages; but Rondot⁸ has reported a case of delirium tremens, during the course of pneumonia, in a man who had been long employed in a distillery where he was continually immersed in the vapor of alcohol. The value of this case is considerably impaired by the admission of the patient that he was frequently obliged to taste the alcohol, though never swallowing it. Marandon de Montyel⁹ has, moreover, shown that the wine-tasters of Burgundy never develop alcoholism unless they actually swallow a portion of the wine which they are employed to taste.

The characteristic effects of acute intoxication with alcohol have been so long known, and are so fully described in works which treat of toxicology, that it is not necessary to make anything more than a passing allusion to a case reported by Chaumier,¹⁰ of a child, two years and a half old, who was made dead drunk with brandy given to him by a brother seven years of age. In this

instance the commencement of intoxication somewhat antedated the usual age, for we are told¹¹ that the young peasants of Normandy do not usually begin the immoderate use of alcoholic drinks till they have celebrated their first communion, that is, when about thirteen or fourteen years old.

The chronic forms of alcoholism have lately been carefully studied by Crothers,¹² Mann,¹³ Godding,¹⁴ Parks,¹⁵ and Gorton,¹⁶ in the United States; by Kerr and Drysdale¹⁷ in England; by Turdot,¹⁸ Alglave,¹⁹ Regis,²⁰ and Lavrand²¹ in France; by Vierordt,²² Leppmann,²³ Bunge,²⁴ and Ulthoff,²⁵ in Germany; and by numerous contributors to the International Congresses held in London and Zurich.

Of all these authors Crothers is the most prolific. He has touched the subject principally upon its social side as related to the condition and welfare of the individual and of society, bringing together an immense mass of interesting observations in support of the proposition that inebriety is the expression of a particular disease of the nervous system, and that it must be studied and treated in accordance with the general principles that guide the physician in his study and treatment of all other diseases.

From the researches of these authors, it appears that inebriety is a nervous disease closely allied to insanity, which manifests itself either periodically or constantly. It may commence suddenly as a consequence of some severe shock to the brain. This shock may proceed from either physical or mental sources. The disease may also have its origin in the social habits of the patient, who from a simple convivial drunkard may become transformed into a regular inebriate. It may be produced by the action of other poisons besides alcohol, so that there may be as many varieties of inebriety as of narcotics. There must, however, be a predisposition to inebriety in order to effect its evolution. Healthy men without neurotic predispositions may drink voluntarily in moderation without thus breaking down. But an intercurrent disease may turn the tide against even such individuals; and, if they do not themselves suffer the penalty of indulgence, their children will be found far on the road that leads to inebriety. Hereditary influences are among the most potent that determine this disease, and they follow the usual course. Thus, in mixed families, the male children of an inebriate mother, or the female children of an inebriate father, may

alone exhibit the morbid tendency. The relationship of inebriety to insanity is further shown by the well-known fact that children of inebriate parents begotten during a period of debauch may be either insane, or inebriate, or victims of epilepsy, neuralgia, and other grave manifestations of nervous degeneration.

Morbid Anatomy.—First among the evidences of the evil effects of alcoholic excess is the physical deterioration of the outer man. Among the French conscripts it is noticed²⁷ that the young peasants who drink from childhood fall below the military standard, while those who are sober develop normally. As drunkenness increases, the rejections from military service also increase for the above reason. In the department of the lower Seine, the rejections for this cause increased from 6 per cent. in the year 1873 to 24 per cent. in 1886. The population is thus doubly injured, for the vigorous youths are carried away to destruction in the army and navy, while the debased inebriates are left at home to propagate their kind.

It is unnecessary to pass in review the morbid changes in the internal viscera with which the members of the medical profession have long been familiar. But, during the past year a number of interesting contributions have been made to our knowledge of the effects of alcoholic poisoning upon the nervous system. Vierordt²⁸ reports a case in which lancinating pain, ataxia, becoming afterward indistinct, with final extinction of the patellar reflex, reached a fatal termination. The autopsy revealed gray degeneration of the columns of Goll in the medulla oblongata, and in the cervical and dorsal portions of the cord. The lower part of the dorsal cord was slightly degenerated. The posterior nerve roots from the mid-dorsal region into the lumbar region were also affected. The peripheral nerves appear to have escaped. The muscles of the lower extremity exhibited great increase of mechanical irritability, which was explained by a morbid proliferation of the nuclei of the muscular interstitial tissue.

Mann²⁹ calls attention to cerebral changes, consisting in thickening and increase of the pia mater and arachnoid, and permanent infiltration of the former and a varicose condition of its vessels, as a result of continued abuse of alcohol. . . . The patient may acquire a chronic meningitis, the prominent symptoms being impairment of memory, dullness of intellect bordering on

dementia, trembling of the limbs, tottering gait, hesitating, slurring speech, and other symptoms of gradually progressing paralysis."

Biggs³⁰ has reported to the New York Neurological Society the post-mortem appearances in the case of a moderate drinking female, aged twenty-five years, who began six weeks before death, "to have pains in her legs, followed by a painful, wasting paralysis involving the legs chiefly, and the arms slightly. In the lower extremities, hyperæsthesia, paræsthesia, and reaction of degeneration over the affected muscles. Extensors most involved. No implication of bladder or rectum. Death from intercurrent pleurisy. Autopsy. Great emaciation. Legs and thighs notably flexed. Muscles of legs yellow from fatty degeneration. Thigh muscles less affected. Spinal cord and nerves normal in appearance throughout. Microscopical examination revealed slight sclerosis in cervical portion of the columns of Goll. Nerve roots normal. In one of the sacral nerves before its exit from the spinal canal a notable increase in the endoneurium with diminution in the number of the nerve fibres. The same changes were more conspicuous in the right sciatic nerve, and still more so in the posterior tibial nerve, wherein only an occasional nerve fibre could be discovered. The gastrocnemius muscle was completely degenerated to adipose tissue, and its intra-muscular nerves exhibited advanced degenerative neuritis."

In the debate on the above case, Starr alluded to a similar degeneration of the columns of Goll, recorded by Grainger Stewart. Lancereaux³¹ has also reported a case of sclerosis of the cord in chronic alcoholism.

Hadden³² has also described the post-mortem appearances in five fatal cases of alcoholic paralysis. "The spinal cord was healthy in all. In four of the five the nerves were degenerated, but in two the change was rather that of a peri-neuritis. The muscles simply showed increase of nuclei, and occasionally appeared granular. In two cases the medulla was examined and found healthy, and in two the motor convolutions were healthy. The association of phthisis was observed in four cases, and in one the lung mischief was early."

The effects of chronic alcoholism upon the eye have been carefully investigated by Ulthoff,³³ who finds that in alcoholic amblyopia there is a special form of retro-bulbar neuritis occupy-

ing a portion of the outer half of the optic nerve. The degeneration is interstitial, consisting in a proliferation of the connective tissues with secondary atrophy of the nerve fibres. Even in greatly degenerated portions of the nerve, normal nerve fibres remain present, and thus serve to distinguish the degeneration of alcoholic amblyopia from the ordinary gray atrophy of the optic nerve that accompanies tabes dorsalis. Clinically, the ophthalmoscope revealed, in 1000 cases of alcoholism, 139 cases in which the temporal half of the papilla exhibited a morbid pallor, but of these only 60 experienced any visual disturbances. Too much importance must not be given to ophthalmoscopic appearances, because among the above 1000 cases were 9 examples of alcoholic amblyopia which presented no visible changes; and, *per contra*, in three cases where no visual failure was detected, post-mortem section showed pathological changes in the nerve. Again, it must be remembered that in persons who are neither given to drink nor diseased in mind, pallor of the temporal half of the papilla may exist without any diminution of the normal acuteness of vision. Tobacco poisoning produces the same form of optic nerve degeneration that is observed in chronic alcoholism; and, whenever these poisons produce diminution of visual power, they both cause a central color-blindness which ordinarily shows itself as a relative scotoma for red and green, and, in ten per cent. of the cases, also for blue. Alcoholic amblyopia usually occurs between the ages of forty and fifty, while retro-bulbar neuritis from other causes is generally developed between the ages of twenty and thirty, and is ordinarily slow in its progress. Toxic amblyopia, on the contrary, is rapidly induced.

Crothers³⁴ has called attention to the frequency with which inebriates die from pneumonia. "Whenever inebriates exhibit cerebral changes or great exhaustion, the lungs should always be examined. A rapid pulse and high temperature should suggest the same examination. Delirium tremens or great depression, melancholy, change of face, insomnia, stupor, and other symptoms, point to inflammation of the lungs as both a primary and secondary cause."

Leppmann³⁵ furnishes an interesting essay on the delirium of inebriates, or *delirium potatorum abortivum*. This often belongs to the earlier group of symptoms of chronic alcoholism, appearing

before any notable or permanent intellectual failure. It is characterized by tremor, redness of face, coated tongue, cold extremities, often also by heartburn, vomiting, and diarrhœa. The patient complains of headache and oppression of the chest. Then follow hallucinations of the special senses. He becomes moody, grim and restless, cannot sleep, dresses and undresses himself, rummages around his room in an aimless fashion. Sometimes while in this condition, there will be a sudden outbreak of maniacal fury, in which the patient may do himself or others a serious injury. Ordinarily the paroxysm subsides after twenty-four hours, and the patient falls asleep, awaking to convalescence. These attacks may occur even though liquor has not been taken for several days before the onset of the delirium.

Regis,³⁶ also, mentions these events among the phenomena grouped in his vivid description of the effects of chronic moderate drinking. "The poison (in such cases) does its work more slowly, but more surely than in the case of drunkenness. The stomach becomes irritated, inflamed, transformed; the liver is congested, then either hypertrophied or atrophied; the kidneys become sclerosed or fatty; the lungs and bronchi are congested, and acquire an extreme susceptibility to disease; the heart enlarges, and is loaded with fat, while its thickened valves are no longer sufficient; the arteries become atheromatous and may rupture; cutaneous sensibility is either increased or diminished, and is often greatly modified; tremors, convulsions, and attacks of subacute delirium occur; finally, the moral and intellectual faculties give way, and the entire spiritual individuality vanishes in permanent dementia. Sometimes also, on occasion of a shock, either moral or physical in character, under the influence of an illness, or an emotion, or simply as a consequence of temporary abstinence from the habitual stimulant, the patient becomes a prey to violent outbreaks of delirium tremens, which burst out like a flash of lightning, revealing in its true characters the depth of the intoxication. This latent and unconscious form of alcoholism is related to the more conspicuous varieties of alcoholic poisoning very much as the non-convulsive form of epilepsy is connected with the convulsive variety of that disease." Crothers has particularly called attention to the parallelism between these phenomena and the allied facts of epilepsy and insanity. Dipsomania, indeed, is to be

considered as a form of insanity. As Regis remarks, it is a morbid state in which the tendency to excessive drinking is only an epiphenomenon in the downward course of degeneration.

Treatment.—In addition to the use of large and repeated doses of beef-tea, during the paroxysm of delirium or asthenia, great benefit may be expected from the hypodermic injection of strychnia. The Russian physicians, Tolvinsky and Partzevsky,³⁷ report favorable results from strychnia sulphate, given by the mouth, in doses increasing from the sixtieth to the thirtieth of a grain three times a day, or from the hundredth of a grain of strychnia nitrate, given hypodermically twice a day.

For the permanent cure of inebriety, however, nothing avails but special treatment in hospitals provided for this class of patients. Of these, the number is increasing as the public becomes informed regarding the nature of the disease, and the appropriate means of combating its ravages.

Mortality from Alcohol.—An assurance company in London publishes³⁸ statistics highly favorable to the cause of total abstinence. Dealing with total abstainers as one class of risks and with all other insured as a second class, it states that, in the first class, while the expected death-claims are 271, the actual claims are 171. “In the general section 354 claims were expected, while the actual claims were 331. This would seem to show that about one-sixth more die in the general section than among the total abstainers.” Baer,³⁹ of Berlin, has investigated the mortality among 14,295 males who dealt in alcoholic drinks and who used them. Of the whole number 13,528 were over twenty-five years of age.

His results are as follow:—

“Non-handlers of alcohol aged

From 25	had before them	.	.	.	.	32.08 years.
“ 35	“ “ “	.	.	.	.	25.92 “
“ 45	“ “ “	.	.	.	.	19.92 “
“ 55	“ “ “	.	.	.	.	14.45 “
“ 65	“ “ “	.	.	.	.	9.72 “

“Those who had constantly to do with alcohol had in the future:—

From 25 years of age	.	.	.	.	.	26.23 years.
“ 35	“ “ “	.	.	.	.	20.01 “
“ 45	“ “ “	.	.	.	.	15.19 “
“ 55	“ “ “	.	.	.	.	11.16 “
“ 65	“ “ “	.	.	.	.	8.04 “

“Causes of death among the constant users of alcohol and those not concerned with it were:—

GENERAL MALE POPULATION.		ALCOHOL VENDERS.
	Per cent.	Per cent.
Brain disease, . . .	11.77	14.43
Tuberculosis, . . .	30.36	36.57
Pneumonia and pleuritis, . . .	9.63	11.44
Heart disease, . . .	1.46	3.29
Kidney disease, . . .	1.40	2.11
Suicide, . . .	2.99	4.02
Cancer, . . .	2.49	3.70
Old age, . . .	22.49	7.05

“In England 14 per cent. of deaths were caused indirectly by alcohol, 4 per cent. directly.”

A somewhat similar statistical showing has been made by Dr. George Harley,⁴⁰ of London.

The Nutritive Value of Alcohol.—The discussion of this question does not seem to be entirely concluded. Bunge,⁴¹ professor of physiological chemistry in the University of Basle, argues that alcohol cannot be considered as an article of food; or, if any nutritive qualities must be admitted, they are too slight, and are obtained at too great cost to warrant the expense. On the other hand, the celebrated Arctic explorer, General Greely, of the U. S. Army, in an article published in a popular magazine,⁴² says: “The subject of alcohol was frequently and generally discussed during the winter at Cape Sabine, and all, without exception, concurred in the opinion that spirits should be taken after a day’s labor was over, and not before or during exhausting work, nor while suffering from exposure that was to be continued. . . . Later, when the party had been slowly starving for many months, and when the supply of food was so diminished as to necessitate a greater reduction of rations, the pure alcohol on hand was issued as food, being diluted by about three times its weight of water. Each man received daily perhaps a quarter of an ounce of alcohol, the effect of which was most beneficial. The general impression, with which I most heartily agreed, was that the alcohol supplemented food, and had a decided alimentary value. There could be no question of its beneficial effects as a mental stimulus to every member of the party under our unfortunate condition at Sabine.”

MORPHINISM AND MORPHINOMANIA.

Just as the protracted use of alcohol finally produces chronic alcoholism, so the habitual consumption of morphine brings about

a condition of chronic morphinism. Lanceriaux,⁴³ of Paris, has recently described the symptoms of this disease, which may usually be recognized about five or six months after the commencement of the habitual use of morphine. The victim finds, perhaps to his own astonishment, that he cannot do without the drug. Disorders of digestion soon appear; there is loss of appetite and flesh; the countenance assumes a yellowish, earthy tint; the eyes grow dull, and only recover their vivacity after a fresh dose of the drug. The skin becomes dry; the muscles dwindle, and sometimes become cedematous. The patient now suffers with sleeplessness, or with distressing dreams and nightmares; there is loss of memory, and enfeeblement of the moral sense, though the intellectual faculties are still preserved. There are subjective pains experienced in all parts of the peripheral nervous system, sensations of pricking and of crawling, sufferings analogous to the osteoscopic pains of syphilis. General sensibility is also greatly modified,—hyperæsthesia in certain regions with anæsthesia in others. Usually, there is an enfeeblement of the tendinous reflexes, though the plantar reflex is often exaggerated. The universal disturbance of nutrition is further illustrated by the rapid decay and loss of the teeth, and by the early development of baldness. The special senses are not particularly injured, but sexual appetite is abolished; the female becomes sterile, and ceases to menstruate; according to Levinstein,⁴⁴ her entire uterine apparatus may become atrophied.

Between chronic alcoholism and chronic morphinism there are many points of resemblance; but Averbek⁴⁵ remarks that the alkaloid narcotics attack the nervous system first, and, through its ruin, destroy the general health, while alcohol first affects the organs of vegetative life, and through their destruction the nervous system is wrecked. In both forms of chronic intoxication, the frightful dreams, the disturbances of sensation, even the paroxysms of delirium are quite similar.⁴⁶ But in the digestive organs the symptoms of irritation and inflammation are more severe in the victim of alcohol. The morphine eater, moreover, does not exhibit those fibrillary tremors of the lips that are so commonly observed in chronic alcoholism. The drunkard, also, may grow fat, but the morphine victim manifests a repugnance for flesh food, and grows thin. Both diseases predispose the patient to pulmonary tuberculosis. Cerebral degeneration, indicated by enfeeblement of the

moral sensibility and prostration of the intellectual and volitional faculties, forms the basis of the mental perversion which constitutes morphinomania. A tendency to the formation of abscesses in the subcutaneous cellular tissue is usually encountered in chronic victims of morphinism. This is due to the enfeebled health of the patient, and to the fact that the drug is now so frequently introduced by the use of the hypodermic syringe.

In civilized countries morphinism is confined to the human race. It is, also, among the higher classes that the habit is most common. Of one hundred cases studied by Levinstein⁴⁷ thirty-two were physicians. Females, neurotic males, apothecaries and hospital attendants, all whose daily occupation brings them in contact with sick persons and drugs, are the most likely to fall into the habit of morphine-taking. But in Oriental countries it is said that even the lower animals that associate with man become sharers in his fall. Ludovic Jammes⁴⁸ communicates to the Institute of France his observations in Cochin China and Cambodia, where he has seen cats, dogs, and monkeys intoxicating themselves with the smoke of their masters' pipes. These animals present a melancholy aspect, and sleep much more than other healthy creatures. They seem to experience the same effects that are produced by opium upon the human species. The experiments of Mme. Edwards and M. Pilliet,⁴⁹ recently laid before the Biological Society of Paris, show that the daily hypodermic injection of morphine will produce, in animals thus treated, a fatty degeneration of the liver, with atrophy of the cortical cells and development of granular masses along the border between the gray matter and the white substance of the cerebrum. In a case of convalescence from the morphine habit, which suddenly ended fatally, Ball,⁵⁰ of Paris, observed fatty degeneration of the heart and of nearly all the other internal organs. Morphine was found in the nervous centres, in the spleen, kidneys, and particularly in the liver. She had received none of the drug for thirteen days before her death, which seems to have been the result of sudden collapse. Unless this patient had been secretly supplied with the poison, her case is opposed to the majority of observations which indicate that the tissues are very speedily unloaded when the use of morphine is fully suspended.

Dr. Henry Averbek has recently contributed to the pages of the *Deutsche Medizinal Zeitung* a valuable article on the "acute

neurasthenia" produced by sudden abstinence from the habitual use of morphine. He recognizes five grades of intensity in the toxic effects of the drug:—

First stage: The period of excitement, which may be likened to the effect of good wine upon one who is not accustomed to its use. Second stage: The time of pleasure, so far as that can be obtained in a state of Nirvana-like repose, without joy or suffering. Third stage: The period of tolerance. Now the poison must be taken in continually increasing doses, in order to procure any pleasure, or to ward off the terrible misery consequent upon partial abstinence. Fourth stage: Symptoms of absolute poisoning. Increasing doses avail nothing to produce pleasurable excitement. Even the usual quantity of the drug causes nothing but suffering, with all the symptoms of chronic intoxication of the whole body. Fifth stage: Death, from the effects of the poison.

The stage of tolerance is of very variable duration. Ordinarily the victim uses, during this period, a daily quantity of three to eight grains of morphine. Fifteen to thirty grains daily form the largest doses that can be tolerated for any considerable time. Fifty to eighty grains a day must soon develop the effects of poisoning.

Since the effect of an ordinary dose of morphine is exhausted in eight hours, the victim of the morphine habit begins to suffer the painful consequences of abstinence at the end of five hours after his last dose. If now he attempts a cure by sudden and complete withdrawal of the drug, he is plunged at once into the horrors of acute neurasthenia. Every fibre and cell of the entire nervous system cries out for its accustomed solace. So rapidly does the system free itself of the poison that Levinstein asserts that, if morphine can be found in the urine more than three days, or five, at the longest, after the supposed commencement of abstinence, the patient is really taking it secretly.

So profound is the prostration of the sufferer during the period of neurasthenia that his treatment should only be undertaken under the immediate presence and supervision of a physician. For this purpose a properly appointed hospital, or retreat, furnishes the best opportunity. Female nurses are preferable to male, on account of their greater gentleness, persuasiveness, and persistence in dealing with the sufferer.

About five hours, then, after the last dose, the storm of absti-

nence begins. This exhibits its greatest severity in those patients who have habitually consumed eight grains, or more, each day. The sufferer begs for his customary stimulant, weeps and howls if it is refused. He yawns and sneezes many times in succession, he is restless and full of pain. This period of distress continues from three to five days. At first, the functions of the brain are thoroughly prostrated for several hours; then symptoms of spinal exhaustion appear. Coals of fire and streams of molten metal seem to ooze along the spine from the head to the sacrum. Respiration is hurried (100 times a minute), the pulse may beat 150 times a minute. During the third and fourth hours, the ganglionic nervous system begins to take part in the disturbance. The throat burns, the stomach feels as if wounded or scorched. Retching, vomiting, and diarrhœa follow. During all these hours the patient tries every form of movement in search of ease, but all in vain. Only during the utter exhaustion that succeeds to a fit of vomiting does he obtain a momentary relief.

After five to eight hours of such misery the storm subsides. The patient, in ninety-nine cases out of every hundred, can only call for morphine. The phenomena of hysteria, of hypochondria, and of a general mental derangement will now appear.⁵¹ Personality seems lost; the majority of such subjects are now completely irresponsible. The patient is in the stage of complete prostration. If he attempts to write, his hand will shake; letters and even whole words, will be omitted, very much like what may be observed at the commencement of progressive paresis. The pupils are dilated, there may be double vision; the senses of smell and of hearing are abnormally exalted. Hyperæsthesia, rather than paræsthesia, is the characteristic condition during abstinence from morphine. The muscular apparatus is utterly powerless; the patient feels best in the horizontal position. The secretory organs are now in a state of great activity; only the sexual organs remain impotent. The urine frequently contains albumen or, possibly, sugar. As a consequence of the irritable weakness of every part of the body, every impression upon the sensory structures of the entire organization gives rise to a sensation of pain. This tremendous enfeeblement of the nervous system brings the patient to the verge of dangerous, of fatal collapse. To avert this, alcoholic stimulants, especially champagne, are most useful. A return to

small doses of morphine, hypodermically given, may become imperatively necessary. The danger of collapse is most to be feared from the third to the sixth day of abstinence. It is most likely to occur in cases of fatty degeneration of the heart, induced by the conjoined abuse of alcohol and morphine.

After a succession of paroxysms like that above described, at the end of the fourth or fifth day, the first indications of convalescence appear. Appetite for food begins to revive. The greatest dangers and sufferings are past. But the patient is sleepless, enfeebled and depressed in spirit. The nervous system is weak and irritable. The patient is awakening to a sense of his degradation, and may exhibit a tendency to suicide. During the following two to five weeks he remains a thoroughly broken-down man. But the nervous paroxysms occur less and less frequently, and with progressively diminishing severity. The persistent diarrhœa should not be treated with opiates or astringents. Natural sleep begins, and the patient is convalescent. But this period of convalescence, which lasts from three months to two years, is fraught with danger. The sufferer may resort to alcoholic stimulants, thus becoming a toper. The nervous system is in a state of unstable equilibrium; the pupils are variable, with but slight reaction to light; burning sensations are experienced in the fore-arms and legs. There may be constant thirst, with urine of the lowest specific gravity (1001), and a persistent diarrhœa, which, however, must not be checked with drugs.

A characteristic phenomenon of this period of convalescence is the revival of the sexual function. This appetite is not unfrequently now exaggerated to a degree that may lead to injurious consequences. The functional capacity of the brain is, also, considerably increased. But this, by reason of the general enfeeblement, does not qualify the individual for protracted and useful mental activity. He is soon wearied, and his intellectual product is of little value.

Prognosis.—This is good so far as recovery from acute neurasthenia is concerned, but the dangers of relapse into the opium habit are very great. According to Averbek, among physicians who have contracted this habit relapses occur in ninety per cent., among officers in seventy-five per cent. of the cases.

Treatment.—The morphine habit can only be cured by total

abandonment of the drug. Nothing else can be substituted for it. The use of cocaine in its place is a great mistake. Nor can the cure be effected without suffering; there is no royal road to recovery. The only choice lies between two methods; shall we abruptly terminate the use of morphine, or shall we proceed by gradual diminution of the daily dose? Good authorities can be quoted in favor of either method. It seems more physiological, in dealing with a habit that has grown out of gradually increasing doses of the drug, to escape from its grasp by a gradual reversal of the process. It also seems so much more merciful and humane to remove the dog's tail inch by inch each day, in hopes that the good creature may thus become tolerant of the pain. As a matter of fact, this method only prolongs the agony. The best way consists in the adoption of a modification of the method by immediate abstinence. The patient who has been accustomed to the daily consumption of fifteen grains must be reduced to the tenth of this quantity, and this tenth must be divided into three doses at intervals of eight hours. After the eighth day the amount should be reduced to the hundredth part of the original dose. The phenomena of acute neurasthenia will now appear. If collapse is threatened small doses, varying from the fortieth to the tenth of the original, may be administered once or twice during the twenty-four hours, especially at bed time, until the worst five or six days are past. Good wine, champagne by preference, must be given freely. Levinstein's method of giving chloral hydrate in half drachm doses with about a quarter of a grain of morphine is not advisable; it acts like a regular brain-poison. During the period of acute neurasthenia warm baths, of ten or fifteen minutes' duration, should be given every morning and evening. These may be advantageously terminated by thoroughly showering the spine with water a little cooler than the bath. As soon as the appetite begins to revive, massage should be employed, and the baths may be made somewhat cooler.

The patient must surrender his personal liberty for at least four or five weeks. At the end of that time he may be sent to an ordinary hospital, or to a water-cure, for the completion of convalescence.

The method of treatment sketched above is only applicable to ordinarily healthy patients who have contracted the opium habit.

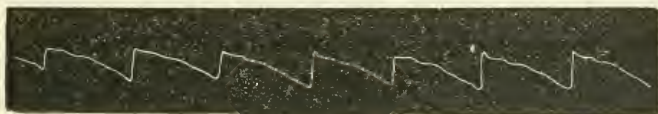
It would be in the last degree inhuman to undertake a cure with the victims of incurable and painful diseases. For such, especially in malignant tubercular cases, and in hemorrhagic uterine cancer,⁵³ morphine affords the best means of relief and prolongation of life.

As an example of the method of cure by gradual suspension of the drug, may be quoted the experience of Winslow Anderson, of San Francisco. His patient was a young lady who had contracted the habit of morphine eating, at the rate of ten to twenty grains daily. Having secured her confidence and willing co-operation, without which little can be done, the patient was supplied with a liberal diet, and pleasant mental occupation. She was medicated with iron, phosphorus, nux vomica, cannabis indica, digitalis and tonics. Sleep was procured with bromides. She was never allowed to re-fill any of her bottles of medicine, or to know what she was taking. Her consumption of morphine was reduced by a quarter or a half of a grain every other day; and at the end of six months she was cured. This corresponds closely with the plan of treatment adopted in the Opium Refuge connected with the China Inland Mission;⁵⁴ but the experience of the physicians connected with the Opium Hospital in Foochow, China,⁵⁵ leads them to favor the method of immediate suppression. Their plan of treatment consists:—

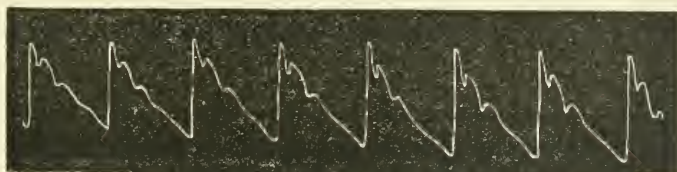
“1st. In confining the patient in the building for the first week. 2d. In the total abandonment of the opium from the commencement of treatment. 3d. In attention to the diet, giving food in small quantities frequently, egg-nog, chicken broth, milk, etc. In some cases whisky or brandy may be required. 4th. Chloral hydrate, grs. xx. every hour, as required, for the first two or three days. This is only given to the extent of relieving the suffering of the patient. Bromide of potass., quinine, iron, tonics, astringents, all have their appropriate places. Various complications require special treatment; for constipation, a dose of castor oil; for diarrhœa, acet. of lead, or tr. catechu; for vomiting and nausea, bismuth or calomel. 5th. The tonic treatment should be continued for several weeks after leaving the asylum. 6th. The desire for opium ceases in a few days, usually by the fifth or sixth. The patients are discharged by the tenth day, but return to their homes in a majority of cases with impaired vitality, dyspepsia, or lung disease that has resulted from the habit of smoking.”

During the past year Oscar Jennings and Ball,⁵⁶ of Paris, have introduced several new remedies for the relief of patients under treatment for the morphine habit. In order to detail the use of opium the urine should be examined,⁵⁷ 1st, with the double iodide of mercury and potassium (Hg. Cl. 13,546, KI 49.80, H₂O to a quart). This gives a yellowish white precipitate with the alkaloids. 2nd. The iodized iodide of potassium (I 10, KI 20, H₂O 500), which gives a yellowish precipitate with morphia salts. If the quantity be too small to discover by one of these reagents, boil the urine to a third, treat with tartaric acid, then dissolve the tartrate of morphia with amylic alcohol; decompose the salt with ammonia, and, if morphia be present, the solution should show a blue color on adding the perchloride of iron. Such examinations are often necessary because patients may be secretly taking opiates when their physician supposes that the habit has been abandoned.

But the most important feature in the treatment advocated by Jennings is based upon information acquired by the use of the sphygmograph. Observing the weakness of the heart that characterizes the period of abstinence, it was evident that the suffering of the patient was largely due to ischæmia of the nervous tissues.



PULSE-CURVE DURING THE ABSENCE OF MORPHINE.



PULSE-CURVE AFTER INJECTION OF MORPHINE.—(*l'Encephale.*)

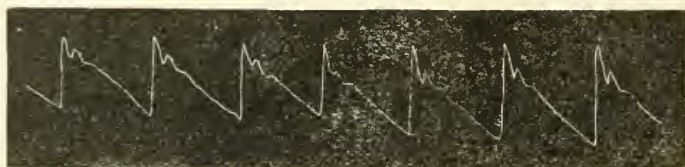
Sphygmographic tracings taken during this stage indicated an enfeebled pulsation with flattening of the apex of the pulse-curve. Hypodermic injection of morphine speedily restored the normal contour of the pulse-curve and relieved the suffering of the patient.

It therefore seemed that if a sufficient cardiac invigorator could be administered in place of morphine, an equally good

result might be obtained. With this end in view, experiments were made with the sulphate of sparteine. This was administered in hypodermic doses of two to four centigrammes whenever the sphygmographic tracing or the sensations of the patient indicated the need of relief. In a few minutes the pulse-curve becomes normal, and the craving disappears. As a similar agent, nitro-glycerine may be employed. This produces a powerful but transitory effect. It is, therefore, most successful when given in conjunction with sparteine. Jennings thinks that "the effect of nitro-glycerine is most satisfactory and persistent in those cases



PULSE-CURVE AFTER .001 OF NITRO-GLYCERINE.



NORMAL PULSE-CURVE, AFTER CURE.—(V Encephale.)

where there is a predominance of the *yearning* over the *craving*,—that is to say, in which the psychological symptoms are more distressing than those of a somatic order."

Opium Eating in China.—But how is it in the Orient? We have been told that in China the use of opium is no more injurious than the moderate use of good wine or beer among the better classes in Occidental countries. Dr. Edwards,⁵⁸ the physician in charge of the Opium Refuge connected with the China Inland Mission, writes us that "in the villages a large proportion of the inhabitants are addicted to the habit—according to the estimation of the people themselves at least 80 or 90 per cent. of the men above 20; 50 or 60 per cent. of the women, many of the young people in their teens, and even some of the children. . . . The common opinion here is that if a man begins to smoke opium and smokes regularly for a month he will at the end of that time have a *yin* or craving which nothing but a further supply of opium will satisfy. . . . At the end of a year he finds his craving so great

that without his pipe he cannot possibly do his work. . . . What this craving is, only those who smoke opium know. The replies of those who have been questioned on this point generally resolve themselves into this, 'When the craving comes on I feel bad all over; my bones and joints ache, and the pain makes me perspire very freely. I am so weak that I cannot work, and I feel if I do not take another pipe I shall soon die.' . . . As to the evil physical effects of this habit on the majority of those who indulge in it, the Shan-Si smoker is no exception to the rule, and generally has his digestive and other functions greatly impaired, and carries with him unmistakable marks in a yellow, dried-up looking skin, sunken eyes, and pinched cheek. As to the evil moral effects, the experience gained during a residence of more than four years among the Chinese has confirmed the testimony of Professor Fraser, of Edinburgh, who, when lecturing to his students said, 'The effects of the habitual inhalation of opium are pernicious, depraving the smoker, the depravity showing itself chiefly in the ability to tell enormous lies.' This is but a small part of the evil, however, for the will of the smokers is so weakened that they can hardly withstand the slightest temptation."

Acute Opium Poisoning.—Kiernan, of Chicago, and Hughes, of St. Louis,⁵⁹ recommend the use of three-drachm injections of tincture of capsicum into the rectum as an antidotal stimulant in cases of opium poisoning. The effect is prompt, but is sometimes attended with the disagreeable consequence of a severe proctitis for a considerable time afterward. Lenhartz,⁶⁰ of Leipzig, has made a number of interesting contributions to the experimental knowledge of opium poisoning and the antagonism between morphine and atropine, which confirm previous opinions regarding their action.

COCAINE INEBRIETY. COCAINOMANIA.

Lanphear,⁶¹ of Kansas City, mentions, among the ordinary consequences of prolonged use of cocaine, an exaggeration of the reflexes, persistent erections during the act of coition, and a spasmodic action of the muscles in defecation and urination. As a later consequence, the cerebral functions are deranged. When not under the influence of the drug, the patient is melancholic, and he may become maniacal. Administration of cocaine then produces an apparent return of reason with exaltation of the

intellectual faculties, only to be followed again by depression as the effect of the medicine passes off. A similar case is related by Comanos Bey, of Cairo.⁶² Crothers,⁶³ of Hartford, who has studied this subject, expresses the opinion that cocaine is a more dangerous intoxicant than either alcohol or opium. He thinks that its rapid and dangerous action will prevent its general use for purposes of intoxication; and that it is seldom taken excepting by those who are already habituated to alcohol and other narcotics. "Its first effect is more exhilarant than alcohol, but it is uncertain and variable. This stimulant action develops mania, followed by narcotism and melancholia. When given in cases for melancholia in large doses, it changes the case to mania, then finally relapses, bringing back the case to melancholia again. . . . As a form of inebriety it is more difficult to treat, requiring a longer time to break up, because of the physical and psychical complications." The experience of Erlenmeyer⁶⁴ agrees with the above. Hughes,⁶⁵ of St. Louis, has also expressed the same opinion. As a substitute for opiates in the treatment of the opium habit, all practical observers agree that the remedy is worse than the disease, and that it should never be given to the victims of inebriety in any form. The treatment of the cocaine habit differs in no important particular from that which has been found applicable to the morphine habit. Freud,⁶⁶ of Vienna, denies the danger of chronic cocaineomania, except in cases of previous morphine or alcohol inebriety, or in cases predisposed to the various forms of inebriety.

THE TOBACCO HABIT.

The principal contributors, during the past year, to the literature of chronic tobacco poisoning are Favarger,⁶⁷ of Vienna, and Gigliarelli.⁶⁸ According to these authors, chronic nicotism is slowly developed, usually after more than ten years' indulgence in strong Havana cigars. Tobacco in this form is more poisonous, because two-thirds of the nicotine in tobacco that is prepared for the pipe is destroyed in the process of preparation. Coomes,⁶⁹ of Louisville, considers the use of cigarettes particularly injurious because of the almost universal practice of inhaling their smoke, and expiring it through the nose, thus exciting general irritation and inflammation of the respiratory passages. Madame Walitzkaja,⁷⁰ as a result of more than a thousand observations on the

health of men, women and children employed in the manufacture of tobacco, ascertained that the inhalation of the factory air, laden with tobacco dust, caused peculiar nervous disorders. She frequently discovered dilatation of the pupils, weakness of the heart, exaggeration of the reflexes, tremulousness of the hands, dyspnoea, gastralgia, headache, and fainting fits. The function of respiration was commonly disordered, but phthisis was not frequent. Tobacco has long been known as a cause of amblyopia, mention of which has already been made under the head of alcoholic amblyopia.⁷¹

Favarger distinguishes four types of smokers: (1) Those who swallow the smoke, and thus cause direct injury of the stomach; (2) those who merely inhale the smoke; (3) those who are continually chewing the end of a cigar; and swallowing the nicotine-impregnated saliva; and (4) those who use cigar-holders, or pipes, that are not properly cleansed.

The symptoms of chronic intoxication are chiefly manifested as disturbance of respiration, circulation and digestion. There is palpitation and irregularity of the heart; dyspnoea or cardiac asthma. Sometimes violent attacks of cardialgia occur. Physical examination frequently gives a negative result; sometimes it reveals fatty degeneration, or chronic myocarditis. There is loss of appetite, a sense of uneasiness, sometimes reaching the severity of actual gastralgia, diarrhoea or constipation. With these disorders the nervous system participates in the occurrence of wakefulness, neurasthenia and faintness on slight exertion. The author is further of the opinion that a fatal case under his observation in which death at the age of 60, occurred from fatty heart, gastric ulcer was due to chronic nicotism; but this opinion is hardly supported by the facts.

Batten,⁷² of Pittsburgh, Pa., reports the case of a man who had inherited from his mother an idiosyncratic intolerance of tobacco smoke. "It first caused an intense pain over both eyes, causing him to knit his brows; then he became as he termed it, cranky, and would fight with his best friend. After this cranky condition had lasted for a time he became sick at the stomach." Ziegler,⁷³ of Philadelphia, reports a similar case. I have, myself, known a patient who was subject to maniacal paroxysms, like those of epileptic mania, which were cured by the disuse of tobacco. Gigliarelli cites a case of loss of memory, cured in like manner. He

also declares that delirium tremens, dementia, loss of sexual power, abortion, and suppression of the lacteal secretion, may all be caused by its abuse. He, however, admits that healthy adults may safely use the article in moderation, but that it should be denied to women, children and nervous persons in general. A fatal case is reported from Philadelphia of a boy, eleven years old, who died from smoking a dozen or more cigarettes daily for ten months.

Treatment of Chronic Nicotism.—Abstinence from the poison; regulation of the digestive organs; tonics, and iodide of potassium, alcohol and morphine. If one will smoke, he must use the weed in moderation, must only smoke after eating; must not always smoke strong cigars; must not chew their ends; and must keep his pipe or cigar-holder clean. Tannic acid is recommended as an antidote to nicotine, hence the anti-nicotic virtue of coffee, tea and red wines, which contain this substance.

REFERENCES.

1. Med. Press and Circular. 2. La Semaine Méd. 3. Tourdot, De l'Alcoolisme dans la Seine-Inférieure; Th. de Paris, 1887. 4. Lancet. 5. Gaz. Méd. de l'Algérie. 6. La Normandie Méd. 7. Am. Pract. and News, Paris Letter. 8. Gaz. Heb. des Sci. Méd. Bordeaux. 9. Annal. Méd. Psych. 10. Revue des Mal. de l'Enf. 11. La Normandie Méd. 12. Jour. Am. Med. Assoc. 13. Alienist and Neurologist. 14. Jour. Am. Med. Assoc. 15. Atlanta Méd. and Surg. Jour. 16. Boston Med. and Surg. Jour. 17. Med. Press and Circular. 18. Thèse de Paris. 19. La Semaine Méd. 20. Jour. de Méd., Bordeaux. 21. Jour. des Sci. Méd. de Lille. 22. Archiv. f. Psych. u. Nervenh. 23. Deut. Med. Zeit. 24. Wien. Med. Presse. 25. Wien. Med. Woch. 26. Brit. Med. Jour. and Deut. Med. Zeit. 27. La Normandie Méd. 28. Arch. of Psych., etc. 29. Alienist and Neurologist. 30. N.Y. Med. Jour. 31. Dic. Ency. des Sci. Méd. 32. Lancet. 33. Ulthoff, Untersuchungen über den Einfluss des Chronischen Alcoholismus auf das menschliche Sehorgan, Berlin, 1887. Hermann Peters. 34. Quarterly Jour. of Inebriety. 35. Deut. Med. Zeit. 36. Jour. de Méd. de Bordeaux. 37. London Med. Record. 38. Brit. Med. Jour. 39. Deut. Med. Woch. 40. Med. Press and Circular. 41. Wien. Med. Presse. 42. The Forum. 43. l'Union Méd. 44. Cent. für Gyn. 45. Deut. Med. Zeit. 46. Archiv für Psych. 47. Cent. für Gyn. 48. Revue de Théor. 49. La Tribune Méd. 50. La Semaine Méd. 51. Morris, in Maryland Med. Jour., Lyon in N.Y. Med. Jour. 52. Erlenmeyer, Die Morphiumsucht und ihre Behandlung, Hensers's Verlag, 1887. 53. Lutaud, in l'Union Méd. 54. First Report of the T'ai-Yuen-Fu Opium Hospital, 1887. 55. Reports of the Foochow, China, Opium Hospital. 56. l'Encéphale. 57. Med. News. 58. Rep. T'ai-Yuen-Fu Opium Hosp., 1887. 59. Chicago Med. Standard. 60. Arch. für exper. Path. und Pharmak. 61. Kansas City Med. Index. 62. Berlin Klin. Woch, 1886. 63. Jour. of Inebriety. 64. Deut. Med. Zeit., 1886. 65. Weekly Med. Review. 66. Wien. Med. Woch. 67. Wien. Med. Woch. 68. Rivista Clinica. 69. Columbus Med. Jour. 70. Med. Press. 71. Uhthoff, Untersuchungen über den Einfluss des chronischen Alcoholismus aus das menschliche Sehorgan. 72. Journal Am. Med. Assoc. 73. Jour. Am. Med. Assoc.

[Undated references apply to journals published in 1887, and original articles can be found by consulting the indexes of the respective publications.]

ORAL SURGERY.

By JAMES E. GARRETSON, M.D.,

PHILADELPHIA.

AFFECTIONS OF SOFT PARTS.

WRIGHT¹ describes a case of occlusion of Steno's duct by the small bearded tail of a chestnut. There was inflammation and abscess of the parotid gland, followed by necrosis of some of the tissues, giving rise to the popular belief that the trouble was caused by the ravages of a "thousand-legged worm." Excision of the orifice of the duct and removal of the foreign body was followed by recovery. Buchanan's case² of salivary fistula of thirteen years' standing was cured by galvanic cauterization of the orifice and subjacent parts of the fistula. Brown³ concluded that the galvano-cautery was irrational in salivary fistula of external origin and without obstruction of the duct. To induce an acute inflammation he therefore filled the sinus with fly-blister, and after several hours this was removed and the sinus pulled together with adhesive strips. A partial union was the result, which was made complete by painting the sinus to its bottom with cantharidal collodion and the use of the adhesive strips as before. Barry's case⁴ of salivary calculus was remarkable for the severe constitutional symptoms it induced, and for the size of the deep-seated phosphatic stone. The ordinary method of removal by incision of the mucous membrane was impracticable, owing to the depth of the calculus from the surface of the mucous membrane. The stone was found at the commencement of the duct of the submaxillary gland, behind the posterior fibres of the mylo-hyoid muscle. It measured one inch by half an inch. Dixon⁴ removed a conical calculus one inch in length and weighing ten grains, from Wharton's duct and the sublingual gland. The operation was through the mucous membrane and under the influence of cocaine injections, but was attended with considerable pain in extracting the body, largely owing to the rough spiculated nature of its under surface. Polak⁵ reports a case that

was mistaken for a tumor of the sublingual gland. The excision operations gave no relief, and then it was concluded that there was necrosis of the jaw. An operation for resection of the jaw revealed a salivary calculus weighing 23 grains. Recovery was prompt. Three cases of successful removal of calculi are reported by Strassman⁶ and Schmidt.⁶

Tumors.—The case of Larrivé⁷ is noticeable from the inability to make a previous diagnosis. The duct of Steno seemed open, the tumor was hard, resistant, the size of a hen's egg, situated in front of the ear. Upon opening it there was a gush of salivary fluid; the pocket was cleaned, a drainage-tube inserted and the wound closed with sutures. The drainage-tube was left in for twenty days, during which time saliva escaped. There was prompt recovery after removal of the drainage-tube. Mr. Cathcart⁸ removed an epithelioma of the sublingual gland and found that the submaxillary gland was also the seat of epithelioma, which was explained as arising from the simultaneous passage of the disease along the respective ducts. Tillaux⁹ removed a benign tumor from the submaxillary gland, which he characterized as an adenochondroma. It was encapsulated, hard, mobile and had existed for a long time without increase or discomfort to the patient. Israel¹⁰ describes a new method of plastic operations of the cheek, the aim of which is to avoid disfigurement from cicatrices. The patient was a man of seventy-one years of age, who had lost a large part of the cheek, up to the corner of the mouth, from chancroid. A long graft was taken from the side of the neck and the supraclavicular region. Two or three subsequent operations were required to bring about perfect union and to make the corners of the mouth appear natural. Bloxam¹¹ describes the extirpation of a rodent ulcer involving the entire nose, nasal cartilages, and the nasal bones, by means of Paquelin's cautery. There was no history of syphilis. Auché¹² removed a sarcoma from the face of a young woman. Bloxam¹³ removed an epithelioma of the lower lip caused, probably, by the continuous smoking of an old clay pipe.

Nervous Affections.—The Editor,¹³ for the relief of severe and long-continued neuralgia, performed a neurectomy of the inferior maxillary and gustatory nerves at the oval foramen, the seat of section being reached by making a trap-door flap of the masseteric muscle, sawing out the coronoid process of the jaw, cutting from

their attachments the temporal and external pterygoid muscles, and ligating the internal maxillary artery, thus reaching and commanding the zygomatic fossa. There has been no return of the neuralgia since the exsection. In another case, the inferior maxillary nerve lying in the canal of the lower jaw was removed by the exsection of the roof of the canal by means of the surgical engine. Galignani,¹⁵ in resecting the inferior maxillary nerve, makes an incision in the middle of the space between the lobule of the ear and the angle of the jaw. Salzer,¹⁶ for the cure of neuralgia, describes a new method of section of the inferior maxillary branch of the trifacial at the oval foramen. A nearly semicircular incision, with the convexity of the curve upward, is made through the integument in the temporal region, above the zygomatic arch. The temporal fascia, the periosteum at both ends of the zygomatic arch, and the temporal muscle down to the bone, are divided. The zygomatic arch is then separated, commencing at the temporal end. The soft parts and periosteum are now carefully separated from the bone and the temporo-maxillary articulation, care being taken to avoid injury of the middle meningeal artery. One thus arrives first at the motor branches of the nerve, then at its sensory branches, and still farther behind, at the artery. A blunt-pointed tenotomy knife, with the edge of the instrument directed from behind forward, will be found most serviceable in dividing either the whole of the nerve or only some of its branches.

HARE-LIP.

Broca¹⁷ brings forward nine new observations confirmatory of the theory of Albrecht as regards dental anomalies in connection with hare-lip. These anomalies are of two kinds,—defects or excess of development. In two cases there was absence of the lateral incisor. The anomalies of excess are frequent, being found in all of the cases except one. Albrecht explains the supplementary precanine incisor as a reversion to the marsupial type of eight incisors. The explanation of these anomalies as a heterotopia, advocated by Volkmann and Magitot, is disproved, it is thought, by the instances adduced. Broca also cites a case of complex median hare-lip caused by the mechanical pressure (and consequent arrest of development) of a tumor connected with the inferior face of the dura-mater and the posterior part of the ethmoid. Broca's

conclusions are thus summarized: (1) The ordinary complex hare-lip separates the median from the lateral incisor and opens into the nasal cavity. (2) When it is bounded by the canine and an incisor, the lateral incisor is generally wanting, and the median incisor is upon the second side of the fissure. (3) In bilateral hare-lip the osseous tubercle has generally two incisors. When it has four, the two lateral are often supplementary, the precanine incisor being upon the external lip of the fissure. (4) It is therefore possible that the few cases where the fissure is between the canine and the two incisors of that side, are explainable as a combination of the atrophy of the lateral incisor and the existence of a supplementary incisor. (5) The hare-lip, as formerly understood, must not, however, be denied. It explains the facial fissure not opening into the nose. (6) The theory of four nasal centres of ossification forming the four maxillary bones best explains the facts. (7) Perhaps hare-lip is often caused by a defect in the length of the external point of ossification. Eigenbrodt¹⁸ gives the statistical results of forty-four operations of hare-lip in the clinic of Trendelenberg from 1882-1885. The operation was performed preferably in the third to sixth month and was a modification of that of Mirault. Up to the present time seven children have died. The cases are divided into three groups: (1) Simple uncomplicated hare-lip, among which cleft-palate is also reckoned. There were seventeen of these cases, fifteen with successful results; one death. (2) Monolateral complicated hare-lip; there were thirty cases, in twenty-one of which the results are known. (3) This group is composed of eight cases of complicated bilateral hare-lip. As to heredity, out of thirty cases, twenty-five gave negative, and five, positive results. A large majority of the cases in each of the groups were male children. In the monolateral cases the left was the side more frequently affected. Owen⁴ describes his method of operation for hare-lip, by which the line of cicatrix proves less noticeable than by former methods. He has entirely given up the use of hare-lip pins in the operation, finding that waterproof strapping has rendered them superfluous. Sutures of fine silver wire are passed deeply, and those of antisepticized horse hair are used for the mucous membrane. Sutures are also passed along the dental surface of vertical and oblique wounds.

In an extensive study, Verchère¹⁹ discusses the after-treatment

of ablation of facial tumors. Union by first intention is the ideal at which the operator should always aim. If a preliminary operation is necessary for the removal of a deep tumor, two methods may be pursued, according to the circumstance: closure of the artificial wound, or leaving it largely open. The first method is advisable in cases of relapsing tumors when a final cure may be hoped for, as in case of naso-pharyngeal polyps. Temporary relief is thus obtained against the fatal final relapse. In the second case, by the aid of antisepsis, one is able to avoid post-operative complications, and by repeated destructions a final recovery may be hoped for. Bruneau²⁰ publishes four observations upon tubercular ulcers of the mouth, with their pathological anatomy, causes, symptoms, diagnosis and treatment. In perfora-



OWEN'S OPERATION.

FIG. 1.—SINGLE HARE-LIP; LINES OF INCISION SHOWN BY DOTS.—(The line of incision, A C, is prolonged to avoid kinking). Operation for hare-lip.

FIG. 2.—LINES OF INCISION ADJUSTED BY FINE SUTURES, NO PINS BEING USED. Operation for hare-lip.—(*London Lancet*.)

tions of the soft palate, Perron³⁸ advises insertion of the ligatures prior to freshening the edges, thus shortening the operation and avoiding the inconveniences of hæmorrhages during the ligation. McCleod³² unites the pared edges by silver wire.

SURGICAL DISEASES OF THE TONGUE.

Brugia and Matteucci²¹ describe two cases of *monolateral lingual disease*, probably due to peripheral lesion of the hypoglossus. In the first case there was right-sided hemiatrophy and deviation of the tongue, with abnormal implication of the structures about the mouth. There was upon this side the reaction of degeneration of the tongue, and of the right half of the orbicularis oris. The diagnosis was atrophy of the hypoglossus from atheromatous pressure, and from the symptoms of the case it was concluded

that the function of taste was entirely independent of the hypoglossus; that the paralysis of the hypoglossus not only produces a deviation of the tongue itself but also of the tip of the same; and that the orbicularis oris, if not entirely innervated by the hypoglossus, at least receives its nourishment with it. The second case was of one-sided tonic cramp of the tongue. With the immobility, painful burning and pricking sensations coexisted. The right half of the tongue appeared normal to the eye, the left half shortened, hardened, cyanotic and cramped. The diagnosis was rheumatic neuritis of the hypoglossus. There was spontaneous cure. Dunott²² describes a case of hypertrophy of the tongue in a girl twelve years of age. The tongue protruded from the mouth a distance of $3\frac{5}{8}$ inches; there was extreme distension of the mouth; the tongue was $4\frac{3}{4}$ inches wide, $9\frac{3}{4}$ inches in circumference. The portion removed weighed over ten ounces. The stump healed and the patient could eat and drink without difficulty. Schech²³ describes a case of black tongue where the "hairs" proved to be excessively hypertrophied, pigmented and horny filiform papillæ. Bocher²⁴ observed two cases of black tongue, in both of which the patches consisted of soft brown hair-like vegetations, about eight millimetres long and very adherent. Numerous spores were found upon the fibres, and the author considers the micro-organisms to be the cause of the disease.

Tumors, etc.—Hitchcock¹ describes four cases of gummatous infiltration of the tongue. The tendency of this form of infiltration to undergo degeneration and ulceration indicates the necessity of its early discovery in order to prevent the ravages of the disease. In none of the cases was the fibrous septum of the tongue the exclusive seat of the deposit. There was in no instance any neighboring glandular enlargement, and in none were the tongue and the soft palate simultaneously involved. Clark²⁶ had a patient with a blood tumor of two years' growth, the size of a filbert, on the margin of the tongue. Feurer²⁷ reports three cases of tuberculosis of the tongue. Operative treatment for tuberculosis is the same as for carcinoma. For generalized tuberculosis, the author recommends as a gargle a solution of camphor 1–300. Poucet²⁸ had a patient with tuberculosis of the right apex and similar ulcerations of the tongue. The patient had been treated with eucalyptol and lactic acid. The local application of lactic acid to

the tongue gave much pain and no appreciable amelioration of the condition.

Smith²⁹ discusses the causes of cancer of the tongue, and from the fact that it occurs more frequently in men than in women, and that it is often found in connection with dental irritation, he concludes that smoking, chewing, etc., may not improbably predispose to the disease. Bernays,³¹ Lange,¹ Richelot³⁰ and Després¹⁹ describe cases of cancer of the tongue necessitating partial or complete ablation of the organ. Epitheliomata of the tongue, requiring partial or complete exsection, are reported by Stephens,⁴ Barker,⁴ Trélat,¹⁹ Le Bec⁷ and Smyth.³²

SURGERY OF THE TONGUE.

Hobbs¹¹ had a case of rare injury of the tongue. A laborer had a habit of protruding his tongue, and, whilst doing so, the chain of a crane hit him under the chin and the tongue was very nearly cut off by the teeth. The wound was three inches from the tip, but the arteries were not divided, and with sutures and treatment, there was complete union with restored sensation and taste. Lockwood⁴ describes a method of restraining hæmorrhage during operations upon the tongue. It is by compressing the lingual artery by the side of the pharynx, near the greater cornu of the hyoid bone, where the tissues are not deep. Forceps are described, so arranged that one blade passed by the side of the tongue into the pharynx, whilst the other was bent to fit the contour of the lower jaw, and meet the other near the tip of the greater cornu of the hyoid bone. Fux¹⁶ describes a case of surgical operation upon the tongue successfully carried out under local anæsthetization by cocaine injections. The cocaine was a 5 per cent. solution. Schmidt¹⁶ details three similar cases. He used a 4 per cent. solution, and thinks stronger ones unnecessary or dangerous. Deroubaix³⁷ discusses the various operative methods of glossectomy. Epithelioma is by far the most frequent cause of operative interference, and the sources of mistaken diagnosis are pointed out. As a general rule, the gravity of a tumor of the tongue is in direct relation to the rapidity of its development. In reference to the frequency of recurrence, it is held that despite this fact, and the fatal results in many cases, operation is always advisable, because it is impossible to tell whether the disease will

recur or not, and the records show that while permanent cures are comparatively infrequent, prolongation of life, at least, is often attained. Neither does the author hesitate to operate as often as the tumor recurs, but he also follows the malady into the submaxillary glands, the gums, maxillæ or pharynx. After a full consideration, it is concluded that the use of anæsthetics is advisable. A ligature passed around the base of the tongue is advised, after which the exsection is made with curved scissors. Other methods of treating epithelioma are discussed, such as cauterization, the preventive or atrophizing ligature, the resecting ligature, the thermo-cautery, and the *écraseur*. The knife (or scissors) is held to be the preferable method in the majority of cases. In removal of the whole tongue, his method requires the division of the lower jaw, which he believes necessary to obtain proper access and to permit ablation of the glands.

The amputation of the tongue practiced by Faucon³³ is by the combined use of the thermo-cautery and the linear *écraseur*. This he believes to be the best method, the excision occupying but from twenty to forty-five minutes and without danger of hæmorrhage. Mudd³⁴ does not use the *écraseur* or the galvanic wire, from the difficulty in controlling the exact line of division. He reports a case of partial excision of the tongue and removal of the submaxillary gland, by drawing the tongue forward and to the right, and using the scissors. Vilpel¹⁹ excised the tongue with the *écraseur*, preceded by ligature of the two lingual arteries. Nourishment of the patient was through the nose by means of tubes and rubber balls, manipulated by the patient himself. McGill⁸ gives a description of his method of excision in four cases under his charge. The operation was preceded by the introduction of a tracheotomy tube, and a sponge attached to a piece of tape pressed into the upper part of the pharynx. This is considered in every way more satisfactory than plugging the trachea with Trendelenberg's tampon. Check retractors are placed in the angles of the mouth and secured by tapes tied at the back of the head. A gag is placed between the molar teeth on one side. The tongue is removed with scissors, the frænum and mucous membrane being first divided, followed by the muscles and arteries of its under surface. He believes the operation of such extreme simplicity that the *écraseur* is wholly useless. The wound is filled

with iodoform and plugged with carbolic gauze; the sponge is removed from the pharynx in about 6 or 8 hours, and the tracheotomy tube in about 24 hours. In the removal of epitheliomata of the tongue, when the whole tongue is not excised, Richelot³¹ circumscribes the morbid patch with three long curved forceps, the first placed transversely behind the tumor, the second longitudinally and dividing the tongue into two unequal parts, and the third beneath and separating the tumor from the floor of the mouth. The tumor is then excised with curved scissors. At first the forceps were allowed to remain for 24 hours, but this gave rise to such pain that he adopted the plan of passing a series of silk-worm ligatures vertically and on a level with the two first forceps. A silk ligature is thrown about the mass below the third forceps, and all the forceps are removed at once. Lange¹ describes the removal of the tongue, with the resection of half of the hyoid bone, and of the jaw-bone, and exsection of the floor of the mouth. The tracheal tampon-tube was used and subsequently replaced by the usual tracheotomy tube. The direct cause of the death of the patient on the subsequent day was not determined. A case of successful removal of the whole tongue for epithelioma, by means of the scissors and *écraseur*, is reported by Smyth.³² Subsequent recurrence in the glands of the neck took place. It is said that after extirpation of the tongue, the patient could talk very distinctly and that he retained some sense of taste. Le Bec⁷ ascribes to pulmonary disease induced by the passage of cold air through the canula, the fatal result of an operation for exsection of the tongue. There was epithelioma of the tongue and soft-palate. The operation was preceded by tracheotomy and ligature of the lingual arteries, with resection of the maxillary. Bernays³¹ describes his operative procedures in three cases of total excision of cancerous tongue. In the first case the chains and steel wires of the *écraseur* having broken, amputation of the tongue at its roots by the scissors resulted in filling the trachea with blood and the apparent death of the patient. A quick tracheotomy revived him, and a complete recovery is reported. In the second case the main operation was preceded by ligature of the lingual arteries, a tracheotomy, and the insertion of Trendelenberg's tampon-canula. The tumor of the base of the tongue proved to be as large as a hen's egg. The operation was without accident and the patient

rallied nicely, but in a few days succumbed to a bronchial catarrh. The third case was operated on by Kocher's method; the tumor was found to involve the whole of the root of the tongue and to be firmly adherent to the hyoid bone and the epiglottis. The submaxillary and some lymphatic glands were also taken away. There was an excellent recovery. Trélat¹⁹ precedes his operation by ligature of the external carotid, and section of the inferior maxillary. He has abandoned the use of the thermo-cautery, preferring the knife or scissors for division of the soft parts. The operation of Barker⁴ was by Kocher's method, and is noticeable from the extent of tissue removed (the tongue, half of floor and all glands of one side) and the complete recovery of the patient, who was fed through a rubber tube,—a method believed to be far better than by enemata or the nasal tube. Stephens⁴ believes it best to operate through the mouth and with the scissors. Exceptionally careful antiseptic measures precede and follow the operation, and laryngotomy is held advisable in most cases. Rectal alimentation is also commended.

DISEASES OF THE ANTRUM.

Barter, as reported by Ghose,³² had two cases of tumor of the antrum requiring excision of the upper jaw. In one case there was complete recovery, and in the other, death from shock. Heath's review of diseases of the antrum²⁶ is of exceptional interest, and is richly illustrated by reproductions of cuts from the original copy of Highmore, and from Catlin's paper in the Odontological Society's Transactions. Suppuration or abscess of the antrum is ordinarily the result of inflammation extending from the teeth to the lining membrane of the cavity. The symptoms are deep-seated pain shooting up the face to the forehead, tenderness of the cheek, and febrile disturbances. An offensive odor is sometimes perceptible to the patient, and there may be discharge of matter from the nostrils. More generally no acute pain accompanies the purulent discharge from the nose. Cases of this kind are doubtless not infrequently treated as cases of ozaena. The neuralgia and frontal headache may also lead to a mistaken diagnosis of abscess of the frontal sinus. Damage to the digestive organs from constant swallowing of purulent fluid during sleep is a common symptom, and may lead to a diagnosis of dyspepsia, etc.

If the pus do not find an exit, the antrum is distended, causing partial absorption of the walls, bulging of the cheek and injury to the floor of the orbit, resulting in displacement and injury of the eyeball. As regards treatment, the first indication is the extraction of carious teeth or stumps, and this is often a sufficient remedy for cases not far advanced. If the teeth are all sound, puncture with the trocar above the alveolus is advised, followed by thorough syringing of the cavity. A mass of inspissated pus in the antrum may give rise to symptoms closely resembling those of tumor of the jaw. The details of such a case are described. Dropsy of the antrum is attended by gradual painless dilatation of the upper jaw until its outer wall becomes so thin as to crackle like parchment. The palate becomes flattened and the nostril blocked by the bulging of the internal wall. The cavity may be drained as previously described. The author believes that such cases originate in the growth of cysts within the antrum or within its wall, and that consequently the term dropsy of the antrum is a misnomer. The treatment of cystic disease consists in incision of the distended membrane and evacuation of the fluid. Polypus of the antrum is believed to occur more frequently than is commonly supposed.

Krause¹⁵ believes that abscess of the maxillary sinus has its origin in the nose, and calls attention to pain in the canine fossa as a frequent symptom of the same. As to treatment, he practices the method of Mikulicz. He attacks the sinus through the nose, replacing the stylet, however, by a curved trocar. In 16 abscesses of the sinus treated by Hartmann,¹⁵ there was but one case in which the cause was manifestly dental. The nose was the point of departure in the other 15 cases. His treatment is by repeated antiseptic irrigation of the sinus. Baginsky¹⁵ and Sublinski¹⁵ believe that areolar or dental changes are more frequently the cause of abscess. Luc⁴¹ reports the cure of a foetid abscess of the left maxillary sinus simulating an ozæna, consequent upon the avulsion of the first upper molar tooth of the same side. The sinus was opened through a dental alveolus. A rapid cure followed its irrigation and drainage. A case very like the last mentioned is reported by Morales.⁴²

SURGICAL DISEASES OF THE PALATE AND JAWS.

Owing to retraction of the flap, the operation for cleft-palate advised by Lannelongue and practiced by Le Bec,¹⁹ does not, in the

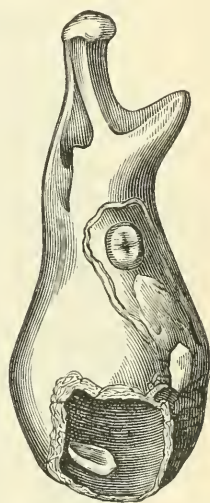
hands of the latter, seem to yield very encouraging results. The method was to detach a flap from the side of the vomer and bring it down to the palate. Broca¹⁷ confirms Albrecht's observation that the cleft does not generally pass between the incisors and the canine teeth. Morian³⁹ contributes a pathological discussion upon the subject of cleft palate and fissures of the face. Parkhill⁴⁰ describes his method of operation for fistula of the hard palate. Chloroform is preferred to ether on account of the vomiting which so frequently follows the administration of the latter. The head is tilted far back so that the blood collects in the fauces and posterior nares, the mouth is kept open by a cork, the tongue drawn out by a suture, the edges of the opening pared and the incisions for the flaps made at either side of the fistula. One of the flaps points forward and the other backward, and the submucous tissues are elevated, including the periosteum, whereby it is expected that the flaps covering the fistula will fill it up by a new bony formation. By the method advised, it is believed that there is an abundant blood and nerve supply to the flaps, that there is no tension causing the sutures to cut out, and that it is the easiest operation. Delorme's¹⁹ operation for restoration of the palatine arch, as reported by Polaillon, consists in cutting two flaps with adherent base from the lip and cheek, and reuniting these in the median line. The superior border of this united flap is joined to the freshened anterior border of what remains of the palatine vault. A horizontal direction is then given to these flaps and a transverse incision liberates the free border of the superior lip, which is then brought in contact with the inferior lip. To fill the space between the anterior border of the tissues and the loosened edge of the superior lip, two other flaps are made at the expense of the tissues of the cheek and malar regions. The grafts required are numerous and extensive, and one can but wonder if the "desired result" were really obtained or whether the desire was extremely modest.

Weiss¹⁹ had a case of osteo-periostitis of the inferior maxilla with deep phlegmon of the hyoid region, having the wisdom tooth for its point of departure. The patient was unconscious, necessitating an immediate tracheotomy and artificial respiration. The abscess from the chin to the hyoid bone was opened by an incision with the thermo-cautery; the canula was withdrawn on the fifth day, the carious wisdom tooth was extracted, and the

patient rapidly recovered. Dr. Goodwillie⁴³ had a case of necrosis of the jaw and suppuration, following disease of one of the lower molars. The method of treatment was by repeated aspiration with the hypodermatic needle. The results were very satisfactory. Streuleus¹⁵ discusses maxillary necrosis of match makers due to phosphorus poisoning. None of the measures adopted for the prophylaxis of the disease are satisfactory, and the only efficacious remedy consists in the substitution of the red or amorphous phosphorus for the ordinary variety. Sweden, Denmark, Saxony, Holland and Switzerland have adopted legal measures against the use of the more toxic variety.

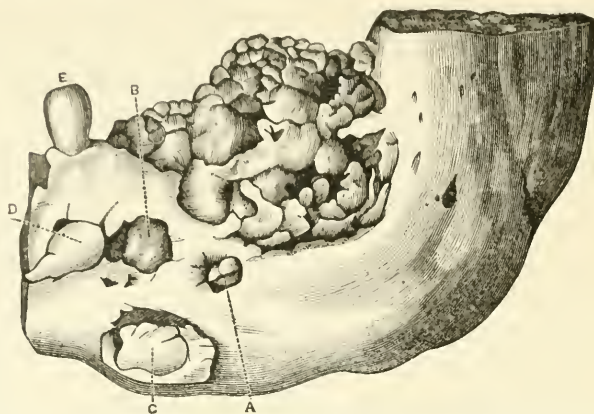
Cysts in connection with the teeth are reviewed by Heath²⁶ in his excellent lectures upon diseases of the jaws. They are classed under two heads; first, those connected with the roots of fully developed teeth, and secondly those connected with imperfectly developed teeth,—commonly called dentigerous cysts. Among those of the first class may be noticed large cysts producing more or less absorption of the outer wall of the maxilla, and which are common consequences of the retention of diseased teeth. These are noteworthy from the surprisingly little inconvenience they give the patient, even when of such large size as to produce deformity of the face. They are commonly confounded with cystic degeneration of the antrum. Instead of a simple incision, it is advisable to

freely cut away the outer wall of the cyst. Periosteal cysts are spoken of as occurring in the lower jaw without any apparent immediate connection with the teeth. The suppuration of dentigerous cysts may be confounded with suppuration within the antrum, or may project into the antrum, filling the cavity or communicating with it. They may also be mistaken for solid tumors. Interesting illustrative cases of such mistaken diagnosis are given. The treatment consists of a free incision and the subsequent extraction of the contained tooth. Sometimes it will be necessary to remove a portion of the front wall of the cyst, and to fill the cavity with lint, so as to induce granulation and obliteration. The researches



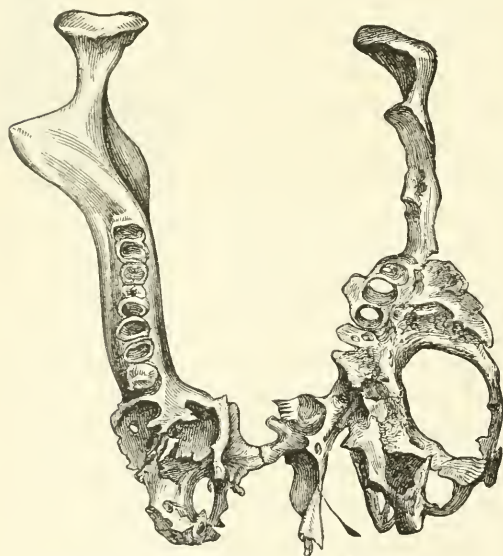
DENTIGEROUS CYST OF
LOWER JAW.—(Brit.
Med. Jour.)

of Mr. Eve, as to the origin of multilocular cysts, is referred to. He believes they are not of dental origin, but that they are pro-



ODONTOME OF THE LOWER JAW.—A, B, portions of tumor projecting through the jaw; C, crown of inverted molar tooth wedged between tumor and maxilla; D, second bicuspid lying below the first, E.—(*Brit. Med. Jour.*)

duced by an ingrowth of the epithelium of the gum. That multilocular cyst is not always a simple local ailment is proved by the history of cases cited *in extenso*. Under the head of "multilocular



ALTERATION IN FORM OF THE MAXILLA BY
MULTILOCULAR CYSTS.—(*Brit. Med. Jour.*)

cystic epithelial tumor," Heath includes the old multilocular cysts and cystic sarcomata, both having a tendency to be reproduced locally, and in certain cases to be disseminated. The treatment of Mr. Butcher, of Dublin, consists in freely dividing the mucous membrane over the cyst, and then, with gouge and bone-forceps, removing the expanded external plate of the bone, with the contents and the lining membrane.

Warren thinks a milder and more conservative practice advisable. Heath is guided by the age of the patient and the amount of

solid material found in the cysts. According to Heath,²⁴ who gives a review of the cases, there have been nine instances of odontomes placed upon record. These tumors depend upon some modification of the germ of the tooth before the formation of the dentine cap, resulting in the formation of an irregular mass of dental tissues, in no way resembling a tooth in shape. All of the cases occurred in the lower jaw of young adults. Five were extracted from the jaw by the surgeon. In one case the mass came away spontaneously and in two cases a considerable portion of the jaw was removed.

The details of three remarkable cases of fibrous epulis are given, removal of which proved entirely successful. In the case of Kinloch, the excised mass weighed nearly two pounds. Fibroma usually springs from the interior of the antrum or from some portion of the alveolus. It is intimately connected with the periosteum, is sometimes due to slight injury, growing slowly but involving in its progress the surrounding structures. If it arise in the antrum, it first



FIBROUS EPULIS.—(*Brit. Med. Jour.*)

expands the walls of that cavity, bulging out the face and forming tumors in the palate and floor of the orbit, absorbing the osseous walls, and spreading unchecked in all directions. If it arise from the alveolus, it may encroach upon facial and palatine surfaces of the jaw, crushing in the antrum, or it may produce complete absorption of its walls and project into the nose through the palate. Illustrative examples of such cases are shown. Allusion is made to a case in which the diameters of a fibrous tumor of the upper jaw were 6 and 7 inches. There was in this case a curious connection with the performance of the uterine functions. Cases are given illustrative of the tendency of fibrous

tumors of the jaw to calcareous degeneration. The author believes that the formation of fibrous tumors between the plates of the lower jaw originates, in the majority of cases, in some inflammatory deposit due to the irritation of decayed teeth. In such cases a milder treatment than removal of the whole thickness of the bone containing such tumors is advised. The details of a case are given which ended fatally, the consequence of mischievous incisions and injections of iodine into the growth. From the long-continued pressure of the tumor, there resulted a remarkable contraction of the hard palate and alveolus, a crushing together and overlapping of the teeth, with an expansion of the malar bone and zygoma.



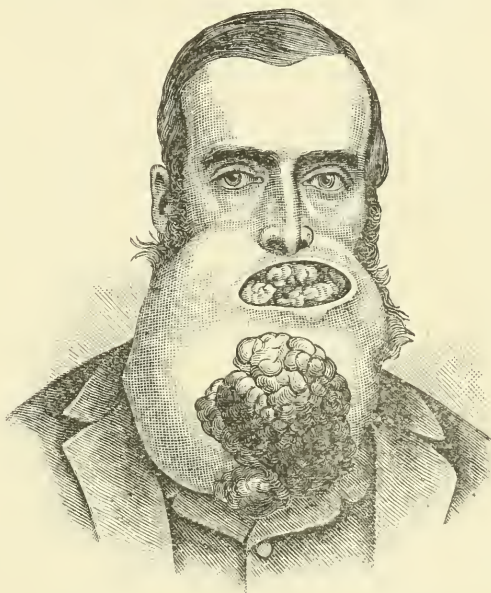
The tendency of enchondroma of the upper jaw to invade the surrounding structures is illustrated by the details of cases given. Enchondroma may be endosteal or periosteal, the latter often growing to an enormous size, causing death by interference with respiration or deglutition.

A case of osteomata of the upper jaw is given, requiring removal of the entire upper jaw. In other instances the tumors were as hard as ivory. In one case it separated spontaneously from the

FIBROUS TUMOR OF UPPER JAW.—(*Brit. Med. Jour.*)

face, and weighed $14\frac{3}{4}$ ounces. In two cases the tumors appear to have taken their origin in the upper wall of the antrum and to have grown forwards. In Duka's case a wedge was cut out of the hard palate, and after an operation of 45 minutes without chloroform, a bony mass was extracted, of a compact, ivory-like character, nearly 3 inches long and weighing 1060 grains. The attachment of the tumor had given way, and it was lying loose in the antrum. Osteomata of the lower jaw may be either cancellated or ivory exostoses, the latter affecting by preference the angle of the jaw. When the exostosis forms a distinct and circumscribed growth, it should be sawn off the bone at the level

of the healthy surface and will probably not recur. If the whole thickness of the bone be involved, the removal of a portion of the bone will be necessary. If the tumor be imbedded between the plates of the jaw, it should, if possible, be enucleated without any external incision. As an example of the enormous size which spindle-celled sarcoma may attain, we note the measurements of the following case: from the lobule of one ear round the chin to the lobule of the other ear, $19\frac{1}{2}$ inches; from the edge of the lower lip over the chin to *pomum Adami*, 13 inches; weight of the removed tumor, 4 pounds 6 ounces. There were fungous protrusions upon the tumor caused by the application of quack remedies. Numerous interesting examples are given of myeloid sarcoma of the upper and lower jaw, of chondro-sarcoma, and of ossifying sarcoma. Round-celled sarcoma or medullary sarcoma is of frequent occurrence in the upper jaw, and from its vascularity and rapidity of growth, has often been mistaken for medullary cancer. The disease



SPINDLE-CELLED SARCOMA OF LOWER JAW.—(*Brit. Med. Jour.*)

generally begins in the antrum, protruding thence into the nose and mouth, and shows a decided tendency to fungate. It may extend across the median line of the face, and occasionally involves both upper and lower jaws. In the lower jaw round-celled sarcoma usually begins in the interior of the bone, first expanding and ultimately breaking through into the mouth, or through the skin of the face. Of epithelioma, the squamous variety always begins in the gum or palate, whilst the columnar always begins in the antrum, secondarily extruding into the mouth, nostril, orbits, or upon the face. The disease begins insidiously.

and in patients over 40 years of age. In the lower jaw the columnar epithelioma occurs in connection with multilocular cysts and with single cysts. The squamous is the more common form, and is found both in connection with ulceration of the gums, and as a tumor of the jaw. The lower jaw is liable to be invaded by epithelioma spreading to it from the tongue and lip, and may be affected by both epithelioma and sarcoma developed in the neighboring lymphatic glands. Interesting cases are described illustrating these various forms of malignant growths. Of course nothing but early and free removal offers any chance of relief. The following cases of tumors are reported: a giant-celled sarcoma of the lower jaw by Divine;⁴¹ an osteoma of both superior maxillæ by Stimson;¹ two enormous cancerous growths of the superior maxilla by Servais;³⁵ three cases of subperiosteal osteoma by Trélat;⁴⁵ epithelioma of the superior maxilla, by Monod and Récamier;⁴⁶ myeloid sarcomata of upper jaw (removal of superior maxilla, and recovery) by Hind,⁴ and by Jessett;¹⁴ tumor of lower jaw by Swain and Buchan;²⁶ epithelial tumor of lower jaw by Allgayer;¹⁰ two tumors of antrum with excision of upper jaw by Barton;³² sarcoma and cystic tumor of the lower jaw, epitheliomata of nose, cheek, lip, tongue and lower jaw, by Barton;³² epithelioma requiring the removal of part of the jaw, tongue, side of pharynx and soft palate, by Barker;⁴ myeloid sarcoma of both superior maxilla, hard and soft palate, with recovery, by Jessett;¹³ sarcoma of the angle of the jaw by Malfait;³³ an epulis by Tédénat;³⁶ a cystic sarcoma by Chambers;¹⁷ osteoma and periosteoma by Rickert⁴⁷ and by Winslow;⁴⁷ osteoma of the superior maxilla, removed without an excision through the cheek, by Wyeth;¹ epithelioma by Gruget;⁴⁸ enchondroma by Hamilton.¹ Heath and Pollard²⁶ report the details of the following cases: ossifying sarcoma of the upper jaw, excision of the jaw, recovery; squamous epithelioma of the upper jaw, excision of the entire jaw, death; squamous epithelioma of the alveolus of the upper jaw, excision of the growth, laryngotomy during the operation and blood sucked from the windpipe, death from lobular pneumonia; squamous epithelioma of upper jaw, partial excision of jaw, recurrence; enamel-organ tumor of lower jaw, excision of half the jaw; cured.

Foreign Bodies.—Packard⁴⁴ had a severe case of injury of the

upper maxillary bones with destruction of the antrum and floor of the orbit, treated by stuffing the cavity with iodoform gauze. Dr. Béranger-Ferrand¹¹ describes the extraction of a knife-blade from the face just above the zygomatic arch, which had been buried there for nine months. For two months the wound had suppurated and then healed. Considerable rigidity of the jaws followed. Chauvel¹⁵ describes two cases of the extraction of bullets from the bones of the face, which had for several months produced persistent suppuration and caused great annoyance to the patients. He argues against leaving foreign bodies in the face upon the supposition that prolonged suppuration simplifies and favors their removal.

TEMPORO-MAXILLARY ARTICULATION.

Heath²⁶ believes that destructive disease of the temporo-maxillary articulation is more frequent than supposed, and thinks that so few cases of acute disease are recorded because they are often confounded with acute affections of the ear, and that mischief beginning in the articulation may in children induce purulent discharge from the meatus. Two cases of fibrous ankylosis of the joint are referred to, following scarlet fever. The fibrous bands were divided by a tenotome passed into the articulation. Heath believes that in many cases the so-called sub-luxation of Sir Astley Cooper is unconnected with any slipping of the cartilage, but is due to rheumatic or gouty changes in the articulation. There is a review of the literature of the subject of rheumatoid arthritis and the consequent changes induced in the articulation. These changes in old age, after the teeth have fallen out, are quoted from Lane:—

“The results are due to the loss of the teeth and to the consequent modification in the normal movements of the temporo-maxillary articulation, and the general atrophy of the muscles of mastication. It is owing to the action of the masseter and internal pterygoid that the form of the angle of the jaw varies at different periods of life. As these muscles are used with great vigor during young adult life, the surfaces of bone into which they are inserted become strong and dense, and marked by vertical ridges indicating the attachment of the tendinous insertions of the muscles, especially of the masseter, and it is owing to the action of the latter muscle that the margin of the ramus is everted. As these muscles atrophy and become almost, if not completely functionless, the portions of

the bone into which they are inserted lose their prominent ridges, and their everted margin, and become rounded and wasted in a similar manner to that in which that portion of the great tuberosity of the humerus which receives the insertion of the supra-spinatus atrophies in feeble old age. It is this atrophy of the angle which causes the appearance of the jaw peculiar to edentulous old age. The atrophy of the fibro-cartilage is due partly to an atrophy common to it and the muscle inserted into it, and partly to the loss of the movements of flexion of the temporo-maxillary articulation, and to their replacement by a simple antero-posterior movement of the opposing surfaces of bone upon one another. After the fibro-cartilage is removed, the articular cartilage is also destroyed, the surfaces of bone being brought into direct contact. By their mutual friction they destroy one another, and the amount of destruction will depend on the amount and character of the movement to which the bones are exposed, and the vitality of the osseous and nervous systems. When this normal senile degeneration in the temporo-maxillary articulation is well marked, and occurs in an ataxic patient, the condition is described as Charcot's disease. This joint, more than any other in the old subject, undergoes great modification in its form and character."

Noteworthy cases of hypertrophy of the neck and the condyle are described by Heath, and he says it must be admitted that this affection may occur in otherwise healthy subjects, or in those with no other joint affected. The ingenious method of Goodwillie of fixing the lower jaw in cases of arthritis, is described and commended. There is also a description of the same author's methods and devices for breaking down the adhesion by the interdental splint and speculum. Owing to the severe strain upon the patience both of patient and physician, he advises division of the adhesions between the condyle and the glenoid cavity, as practiced by Mr. Spanton, the details of whose method are reproduced. After reviewing the different operations practiced by various surgeons, Heath speaks in praise of a method he has devised and successfully used, consisting in division of the ramus of the lower jaw beneath the masseter by a saw introduced from the mouth. The results of the author's excellent critique of the different methods of operation for closure of the jaws are as follow:—

"In cases of cicatrix, I give the preference to Esmarch's method

of removing a wedge from the lower jaw on one or both sides. The operation is a comparatively easy one, and in cases where only one side of the jaw is affected, restores the patient a very useful though one-sided amount of masticatory power in two or three weeks, and with very little suffering or annoyance.

“In cases of fibrous ankylosis of the temporo-maxillary joint, it may be worth while to try division of the adhesions, and, failing that, to resect the condyle.

“In cases of bony ankylosis of the joint, division of the ramus of the jaw beneath the masseter appears to me the least dangerous and most satisfactory proceeding.”

The modified operation of Mears⁴⁹ is thus described by the author:—“A straight, sharp-pointed bistoury is introduced beneath the masseter muscle on a level with the last molar tooth of the lower jaw. Into the wound thus made the blade of an Adams saw is passed, and the ramus sawn through. The periosteum, with the overlying masseter muscle, is raised by the periosteal elevator, and the wound thus enlarged. The insertion of the temporal muscle is now divided by a probe-pointed bistoury. The tissues on the inner surface are separated by the elevator, the bone seized by the lion-jawed forceps, and an effort made to dislodge it by forcibly twisting it outward. If it yields at the neck of the condyle, the process is afterward chiseled out. If sufficient space is acquired without removal of the firmly ankylosed process, it is permitted to remain, the object being to provide ample space for the formation of an artificial joint. Section of the masseter muscle is made if its tense condition demands it. Hæmorrhage which arises from the division of muscular arterial branches, and possibly of the inferior dental artery, is controlled by pressure effected by packing the wound-cavity with sponges. Wounding of the internal maxillary artery is to be avoided by careful use of the instrument in close contact with the bone in the upper and inner portions.

“Section of the inferior dental nerve is liable to occur, producing anæsthesia in the teeth, and regions of the chin supplied by its mental branch. In one case in which this has occurred, I have observed a gradual restoration of the function. In another, anæsthesia still exists, although nearly a year has elapsed since the operation. The wound-cavity is packed with iodoform gauze, $7\frac{1}{2}$ per cent., and renewed every third day. Manipulation with the

mouth-gag is instituted at the expiration of a week, and maintained for a varying period,—from six to eight weeks or longer, according to the requirements of the case.”

Descriptions of cases thus operated upon, with illustrative cuts, are given. Redier³³ says that in acute closure of the jaws they must be opened under chloroform, in order to make a diagnosis of the exact nature of the trouble. The affection is due to a myositis of the masseters and internal pterygoids. He had a case caused by traumatism of the cheek. In cases of subluxation of the joint (displacement of the inter-articular cartilage), Annandale⁴ operates by the following method: An incision slightly curved, about three-quarters of an inch in length, is made over the posterior margin of the external lateral ligament of this joint, and is carried down to its capsule. Any small bleeding vessels having been secured, the capsule is divided, and the inter-articular cartilage is seized, drawn into position, and secured to the periosteum and other tissues, at the outer margin of the articulation, by a catgut suture. The details of two successful operations of this kind are given. Semm⁵² secures bloodless operations by occluding the calibre of the cervical vessels with an Esmarch elastic tourniquet. The trachea is isolated by cutting down upon it, and the pressure then applied sufficient to check the arterial current to the head, and yet allow of a supply to the brain by means of the vertebral arteries which are not occluded, on account of their great depth and protected situation.

The following surgical operations upon the jaw are noteworthy: Howe⁵⁰ removed the right half of the lower jaw by slow enucleation, leaving the old periosteum intact, from which a new jaw grew. Summers¹³ reports two successful cases of resection of the inferior maxilla,—the first on account of malignant epulis, the second for sarcoma commencing in the periosteum. Rogers⁵¹ had a case of encephaloid, beginning in the antrum of Highmore, for which he removed the “superior maxillary, malar, nasal, inferior turbinated and greater portion of lateral mass of ethmoid, left side, and denuded the cribriform plate of its diseased mucous covering.” There was a fatal recurrence of the disease four and one-half months later. The five cases of excision of the jaw reported by Heath²⁶ are capital examples of the best methods of procedure, the technique and the complications arising during

the operation. The same may be said of the interesting cases reported by Barter and Ghose.³² The prompt healing by first intention following extensive removal of the upper jaw and floor of the orbit, renders Hinds' operation⁴ noticeable.

The speedy recovery in the case of Jessett,¹⁴ after removal of the greater part of both superior maxillæ, the hard and soft palate, is also remarkable. He attributes the success as largely due to his method of dividing the bones, by which the pterygoid process of the sphenoid bone was preserved intact. Kerr⁵⁴ reports three cases of successful excision of the upper jaw, and says that in some ten cases of removal of one entire side of the maxilla and the malar bone, at the China Medical Missionary Hospital, none were fatal and all were presumably successful. Wyeth¹ successfully removed the superior maxilla and whole of the antrum by the subperiosteal method, without incision through the soft parts of the face. Richelot⁵⁵ reports a successful case of bone-grafting of the lower jaw. The patient was an hysterical girl with an asymmetrical condition of the face, from a lack of correspondence of the maxillary bones. Two centimetres of bone were excised through the mouth, followed by a hard fibrous growth between the fragments. The fragments were drilled and reunited by means of a graft of bone taken from the tibia of a calf, previously rendered aseptic. The reunion was perfect, and barring a slight defect in the articulation of the teeth, the results were all that could be desired. The sensibility of the lips was not impaired. Marshall⁵⁶ grafted twelve small pieces of bone from the femurs of a rabbit into the gap, 1½ inches wide, of the lower jaw of his patient, and he believes the operation will prove successful. In a case where the ramus and condyle of the lower jaw had been removed for sarcoma, the resulting dislocations of the other side were obviated by Mr. Rosenthal³⁵ in the following manner:—

Gold bands were fitted accurately to the last molar of each jaw on the side where the bone had been removed, to the upper of which a thick, slightly curved wire was soldered. This wire fitted loosely into a tube soldered to the band round the lower tooth, and the bands themselves were fixed to the teeth by screws tapped into them. The apparatus entirely prevents the dislocation, and, although there is no lateral movement the patient can eat fairly well.

REFERENCES.

1. N. Y. Med. Jour. 2. Glasgow Med. Jour. 3. Chicago Med. Jour. 4. Lancet.
5. Cent. f. d. Med. Wiss. 6. Dent. Med. Zeit. 7. Jour. de Méd. de Paris. 8. Edinburgh Med. Jour. 9. Le Praticien. 10. Cent. f. Chir. 11. Med. Press. 12. Jour. de Méd. Bordeaux. 13. Med. Reg. 14. Med. Bull. 15. La Semaine Méd. 16. Wien. Med. Woch. 17. Bull. d. l. Soc. Anat. 18. Berlin Klin. Woch. 19. Gaz. des Hôpitaux. 20. Thèse de Paris. 21. Archiv. Ital. per le Malat. nervos. 22. Am. Surg. Assoc. 23. Münch. Med. Woch. 24. Jour. Laryng. 26. Brit. Med. Jour. 27. Corrb. f. Schweiz. Aerzt. 28. Lyon Méd. 29. Pacific Record. 30. Rev. de Laryng. 31. St. Louis Med. and Surg. Jour. 32. Indian Med. Gaz. 33. Jour. des Sci. Méd. de Lille. 34. Weekly Med. Rev. 35. Med. and Surg. Reporter. 36. l'Union Méd. 37. La Presse Méd. Belge. 38. Gaz. heb. des Sci. Méd. Bordeaux. 39. Archiv. f. Klin. Chir. 40. Virginia Med. Monthly. 41. Soc. Méd. Prat. 42. Gaceta Méd. Cat. 43. New York Acad. Med. 44. Atlanta Med. and Surg. Jour. 45. Le Progrès Méd. 46. Soc. Anat. de Paris. 47. Md. Med. Jour. 48. Gaz. Méd. de Nantes. 49. Trans. Coll. Phys., Phila. 50. Pathological Society. 51. Miss. Vall. Med. Mo. 52. St. Louis Weekly Med. Rev. 53. Ninth Inter. Med. Cong. 54. China Med. Miss. Jour. 55. Soc. de Chir. 56. Jour. Am. Med. Assoc.

[Undated references apply to journals published in 1887, and original articles can be found by consulting the indexes of the respective publications.]

DENTAL PATHOLOGY AND THERAPEUTICS.

BY W. XAVIER SUDDUTH, M.D., F.R.M.S.,

PHILADELPHIA.

SIXTH YEAR MOLAR.

DR. J. E. CRAVENS, of Indianapolis, contributes a valuable original article on the sixth year molar, which appears in the mouth during the period of youth just beyond infancy, when there is utter indifference to personal cleanliness, and when the sense of pride, which has not yet been developed, cannot be appealed to. The diseases incident to early youth, the habit of taking into the mouth all sorts of substances to chew, whether pernicious or not; and these, added to general neglect of the teeth, induce a vitiated saliva,—conditions that are decidedly favorable to a rapid progress of decay. Notwithstanding the urgent advice of dentists, parents cannot always be induced to devote personal attention to the teeth of their children, and many will not go to the expense necessary to obtain competent dental services for children under 10 to 15 years of age. Meanwhile some of the members of this group of molars are lost.

The permanent “first molar” has four distinct functions:—
(1) To supply additional surface for mastication when development has progressed so that the deciduous molars, unaided, are no longer competent to meet the requirements of nature. (2) To support the crowns of the deciduous molars, when they have become unstable, because of absorption of their roots to accommodate the advance of their immediate successors, the bicuspid, which are usually erupted between the ninth and the eleventh year. The deciduous molars begin to loosen six to twelve months before their final displacement. Should a permanent first molar be extracted early, say between the seventh and the eighth year, the deciduous molars supported by it would loosen prematurely, so as to be unserviceable for mastication, and perhaps be lost six to twelve

months before the eruption of the succeeding bicuspid. (3) To guide the second bicuspid into position. In event of a loss of this molar previous to eruption of the second bicuspid, the latter is liable to erupt back of its true position, or after erupting nominally to float backward along the ridge of the gum, inclining posteriorly in such a manner as seriously to impair its effectiveness as a masticating organ. This is particularly the case in the inferior maxilla. (4) To induce additional development of the horizontal portion of the lower jaw, immediately anterior to the ramus, in order to make easier the eruption of the permanent second molar, and to prevent the well-known tendency of the latter to tip forward, thus weakening the support of its roots and impairing its value as a grinder. The permanent first molar is supposed by many observers, to exercise an important influence in establishing a proper angle to the inferior maxilla. If such idea is correct (and several conditions indicate that it is) it adds possibly another to the already long and important list of the functions pertaining to this tooth.

Dr. Cravens draws the following conclusions:—(1) The permanent first molar should receive the earliest and best possible attention of the dentist, and should be preserved if possible for a life service, in order to avoid the probable consequences of extraction. (2) To extract the permanent first molars of both sides of the maxillary arch, for the sole reason that one of them must be removed, is as criminally heroic as to extract the pairs of any other groups of teeth upon the same hypothesis. (3) There are three periods of eruptive development, at either of which, under certain conditions, the extraction of the permanent first molar may be followed by deplorable consequences to the deciduous molars and permanent teeth,—notably the second molar and bicuspid. (4) The proper periods and conditions for the necessary extraction of the permanent first molar are as follow: (1) After the second bicuspid is in full occlusion, and well supported therein by alveolar process, presumably at about eleventh year; (2) after the permanent second molar is in full and substantial occlusion with good alveolar support, which should be at about thirteenth year; (3) after the third molar (wisdom tooth) is in full occlusion and the alveolar support well established, which is usually at about twentieth year.

PARASITES OF THE MOUTH.

Prof. Miller, of Berlin, in an original paper for the *ANNUAL*, says:—

It has long been known that the human mouth was the abode of numerous microscopic organisms; but only within the last five or ten years, since the more exact methods of bacteriological investigation have come into use, have we been able to acquire much definite knowledge as to the morphalology, physiology, etc., of their minute organisms. Recently the study of the bacteria of the human mouth has been zealously pursued by various investigators, and much has been accomplished toward bringing to light the causes of various affections of the mouth and associate parts. There is no part of the human organism which furnishes a more universal culture-medium for bacteria than the oral cavity, and the different varieties of micro-organisms that find in it conditions favorable to their development, are correspondingly numerous. Of these, the larger part are of a non-pathogenic character, existing upon the various organic substances in the oral secretions, and upon particles of food which have been allowed to remain between the teeth, but producing no particularly deleterious effect upon the surrounding part other than decay of the teeth.

The principal transformations of food substances which are brought about in the human mouth by the agency of microscopic organisms, are the following:—(1) Inversion or hydalization of cane-sugar; expressed by the formula, $C_{12}H_{22}O_{11} + H_2O$ (cane-sugar) $= C_6H_{12}O_6$ (levulose) $+ C_6H_{12}O_6$ (dextrose). The power of investing cane-sugar is seemingly possessed by the majority of bacteria. (2) Conversion of starch into sugar; probable formula, $C_{24}H_{40}O_{20} + 3H_2O = C_6H_{10}O_5$ (dextrine) $+ 3C_6H_{12}O_6$ (grape-sugar). There is in the mouth only one bacterium which possesses this power in a marked degree. Vignal¹ describes three bacteria that produce sugar from starch. (3) The division of sugar into lactic acid; formula, $C_6H_{12}O_6 = 2C_2H_3O_2$,—a power possessed by a large number of oral bacteria. This formula does not, however, accurately express the chemical reaction for all cases. Sometimes large quantities of gas are produced— CO_2 and H , also small quantities of formic, acetic, and butyric acids; but as these are in only small and inconstant quantities, as byproducts, the experiments

must be made on a large scale in order to obtain enough to detect. (4) Peptonization; conversion of albumin into a soluble modification (peptone). This property is also possessed by the majority of bacteria, both in and out of the mouth. One of the principal results of these life manifestations of the oral bacteria is the production of decay of the teeth. It has been proved within the last five years that decay is caused by a decalcification of the tooth substance, followed by a solution of the decalcified basis substance. This decalcification is brought about by acids, chiefly lactic; and these acids are principally produced by the action of micro-organisms on carbohydrates. The solution of the decalcified tooth substance is accomplished by the peptonizing power of the same or other micro-organisms.

The action of the bacteria of the human mouth is, however, by no means confined to dead substances found in the mouth; but a great variety of affections of associate parts, as well as of more remote parts of the body, has been traced to their action.

Many years ago Leyden¹ and Jaffe pointed out that the bacteria which are found in the mouth, even in a state of perfect health,—especially *leptothrix buccalis*,—may, under predisposing circumstances, give rise to severe lung diseases. And James Isral, who has given much time to the study of the transportation of bacteria from carious teeth, describes a number of cases of abscesses on the neck, chronic pyæmia, etc., which owed their origin to bacteria, either swallowed or inhaled from the mouth. Again, every one is familiar with the tooth abscesses which form on roots of teeth, and which are caused by an infection primarily from the mouth. Chronic or acute disturbances of digestion are also often brought about by the continual swallowing of bacteria lodged in the mouth. Most of the bacteria of the human mouth may pass through the stomach without losing their vitality; and under certain circumstances may produce severe disturbances both in the stomach and the intestines.

Recent researches have also shown that pathogenic micro-organisms, besides such as produce simple local inflammation or suppuration, find a favorable culture-medium in the human mouth. Many circumstances point to the conclusion that such pathogenic organisms may exist in the mouth without manifesting themselves in any way different to that of the ordinary saprophytic bacteria,

so long as the mucous membrane remains intact. If, however, this becomes reduced in its power by resistance through any cause, or its integrity is at any place destroyed, then such bacteria may manifest their characteristic action. In this way we can explain the frequent occurrence of extensive suppuration, of abscess, necrosis, even of pyæmia, of diphtheritic and other affections, after extraction; and also the fact that it has proved dangerous to scratch one's finger on a sharp tooth in an unclean mouth.

The occasion of frequent presence of various pathogenic bacteria in the human mouth has recently been proved beyond all doubt by different bacteriologists. The first experiments which demonstrated the pathogenic nature of the oral bacteria (or of the saliva, as was then believed) were made in America by Sternberg;² also an account of a fatal form of septicæmia in rabbits, produced by subcutaneous injections of human saliva.³ Vaccination of smaller animals was repeatedly followed by their death. Reynaud and Lannelongue vaccinated rabbits with the saliva of a child who had died of hydrophobia. The rabbits died in less than twenty-four hours. The micro-organisms had the form of the figure 8, were surrounded by a gelatinous sheath, and could be cultivated in calf's broth. Pasteur was of the opinion that this micro-organism had some etiological connection with rabies. It has, however, probably nothing to do with rabies, since it has been found in the saliva of healthy persons. A. Fränkel⁴ mixed the saliva of healthy persons with broth, and allowed this mixture to stand from 4 to 6 hours at blood temperature. Many rabbits vaccinated with this mixture died in from 24 to 48 hours, of septicæmia. In some cases he accomplished the same result with saliva. Miller⁴ obtained like results by vaccinating mice and rabbits with saliva from the mouth of a woman affected with mycosis tonsillaris benigna. The animals died within thirty hours after vaccination. The micro-organisms were found in great numbers in the tissues and in the blood. He has also within the last few months found a number of bacteria in the mouths of persons suffering from various forms of gingivitis, stomatitis, pyorrhœa alveolaris, etc., which possess undoubted pathogenic and pyogenic properties. These investigations will be published in due time. Black⁵ repeatedly found pus-forming bacteria in the human mouth, and Kreibohm, in the Hygienic Institute of Göttingen, found four kinds of bacteria, which proved

to be exceedingly poisonous to mice and rats. Two of these bacteria he succeeded in cultivating on artificial media.

Similar results were obtained by Biandi, who describes five different kinds of pathogenic bacteria which he has found in the human mouth. Up to the present time no less than nineteen different pathogenic micro-organisms from the oral cavity have been the subject of experiment,—a considerable number, but which will doubtless be increased by subsequent investigation.

These observations are designed only to show what a wide and important field for investigation we have in the human mouth; what a deleterious effect neglect of its proper care may have on the general health; and particularly the care which should be exercised in all operations upon the mouth, extractions included, in order to avoid unnecessary infection of the wound during or subsequent to the operation.

SUPPURATION.

Black,⁵ of Chicago, concludes an interesting paper on suppuration with the following deductions: "Having established the fact of the presence of certain pus-forming fungi in the mouth, it is pertinent to inquire under what circumstances and what conditions do we, as dentists, have to take them into consideration and guard against their deleterious actions. The most common is by infection of the tissues beyond the apical foramen, through the apical foramen, by the entrance of pus-forming micro-organisms from the saliva or by means of unclean instruments. To eliminate these elements of infection, the pulp cavity should be opened under the strictest antiseptic conditions. The rubber-dam should always be placed or else napkins used to keep out the saliva. The instruments to be used in the pulp chamber should be disinfected by heat or bichlor. sol. 1-2000. These precautions should be observed even in cases where the pulp canal is already open, in which case it should be thoroughly disinfected and hermetically sealed, and kept so through subsequent sittings until all danger of the saliva's entering the pulp canal is past." Dr. Black even goes so far in his antiseptic precautions as to advise against opening up a pulp canal when any points of suppuration are present at any other place in the body, not including, however, chronic discharges, although he also looks upon these unfavorably.

Pyorrhœa Alveolaris.—This is a term applied to the secondary stages of a disease that has its inception in a catarrhal stomatitis. Being confined, as a rule, to the margins of the gums surrounding the teeth, it might be called a “gingivitis,” were it not for the general catarrhal tendency shown by the entire mucous membrane of the mouth and nasal passages. The intimate relation between a general catarrhal idiosyncrasy and pyorrhœa alveolaris is more than a mere coincidence. Its common occurrence in persons who have irregular teeth has also been often noted by the writer. He considers that this fact has, besides the matter of uncleanness,—which will be considered when treating of the etiology of the disease,—a direct bearing upon its pathogeny. It is well known that the irregularities of the teeth present an indication of a degenerative taint, and that persons in whom irregularities occur are very prone to catarrhal affections of the respiratory organs, including the nasal passages. Their skin is also usually found to be very susceptible to inflammatory affections. Another feature is offensive odor of the saliva of individuals who show this peculiar tendency to catarrhal affections, even in persons who take the most scrupulous care of their teeth. In the majority of cases, pyorrhœa is a form of stomatitis in which the local and constitutional factors in the production of the disease are largely dependent upon a hereditary catarrhal dyscrasia for their ability to engraft themselves upon the tissues. In this position we are borne out by the clinical experience of Patterson, of Kansas City, Mo., in an original communication for the ANNUAL, in which he reports 38 cases of well-marked pyorrhœa observed by him during the past three years, 33 of which presented undoubted evidence of catarrhal conditions of the nasal passages. 2 were the result of direct irritation of misfitting partial plates and the remaining 3 were apparently caused by calcific deposits. He remarks that a close examination into the history of the above-quoted cases confirms him in his opinion that the disease is, as a rule, an “oral catarrh.”

From the foregoing we feel justified in classing the disease as a localized catarrhal stomatitis, which may be either acute or chronic. Acute catarrhal inflammations of the gums begin in circumscribed points, which present a bright or rose-red color, and which are generally located on the margins or the rugæ of the palate. There is but little swelling, because of the dense nature of

the subepithelial connective tissue. The gums present the same stages as are found in inflammation of other mucous surfaces: first, dryness, followed by an increased secretion of mucus; the parts are very sensitive to pressure; the patient complains of an annoying burning sensation; the appearance of the gums is noticeably smooth and glistening, and they bleed easily when the brush is used, or even during a meal. This stage does not last very long, but soon heals by resolution, or passes into a chronic catarrhal stomatitis, in which condition the gums become markedly swollen and turgid. They present a condition of tumefaction that in some instances rapidly passes into hypertrophy; at other times there is an indurated appearance that may last for some time. Granulation tissue may be produced as the result of over-stimulation. The gums become detached from the necks of the teeth; and pockets are formed, from which a fetid discharge may be pressed, giving a peculiar, disagreeable odor. Bullæ are apt to form, which, by rupturing in the process of mastication, give rise to intense smarting. The tongue constantly seeks the surface, if it be on the inner side.

The pathological changes which take place are, according to Newland Pedley,⁷ of England, "hypertrophy of the muco-periosteal fold around the teeth, accompanied by dilatation of capillary loops, enlargement of the papillæ, and rapid proliferation of epithelial cells. Later the gum becomes firm and contracted, and displays increase of fibrous tissue. The changes which go on in the socket have not been as yet satisfactorily worked out; but the examination of the jaws of carnivora apparently affected with pyorrhœa alveolaris lead to the supposition that osteitis of the alveolar process spreading toward the apex of the socket is present. Later, the alveolar walls become absorbed, and are at times more or less denuded, whilst the fangs of the teeth become coated with a layer of thin, hard, green-brown tartar. Ultimately, the disease progressing, the teeth, one after another, drop out."

Etiology.—From what has been said it will be seen that the pathogeny of pyorrhœa alveolaris may be explained in several ways. The general causes are local or symptomatic, or both combined. The most common cause of catarrhal gingivitis is found in local irritation, combined with some hereditary disposition to catarrhal affections. The next greatest etiological factor is

symptomatic,—the local manifestation of a constitutional vice. The most common manifestation is that of syphilis and of its antidotes, mercury and iodide of potassium, both of which sometimes find expression in a localized inflammation, which may be the starting point for a pyorrhœa alveolaris. As a complication of the disease in its secondary stages, there can be no doubt of the action of micro-organism. We do not feel justified, however, in conceding to them, as some do, a position of specificity.

Our position as to the origin of the disease is substantiated by Pedley, above quoted, who finds that in most instances it is due to some constitutional condition; and the fact that it is often symmetrical and frequently hereditary gives support to this view. It occurs in the mouths of patients whose health has been undermined by debilitating influences and injudicious habits of living; it is a common sequel of malarial fever; young persons recovering from eruptive fevers are sometimes subjects of pyorrhœa alveolaris; and frequent pregnancies are a fruitful source of the disorder. Attention has been lately drawn to the shedding of the teeth in *tuberculosis dorsalis*; but it does not, however, seem to be a constant symptom. His views, although tending entirely toward the constitutional character of the disease, do not militate against its catarrhal nature.

Mr. Bland Sutton has found that premature loss of the teeth is a very common feature in cases of rheumatoid arthritis in animals, and has also met with it in *mollities ossium* and other wasting diseases. Magitot, who views the alveolar-dental periosteum as a ligament, and not of the same nature as osseous periosteum, calls the disease symptomatic alveolo-arthritis, and mentions especially as causes chronic Bright's disease and glycosuria, in which latter, he says, the phenomenon is absolutely constant.

Patterson holds "that mouth breathing has, in his experience, been a very common accompanying condition; and he cannot help connecting it with the production of the disease. By it the gums are kept dry, their functions destroyed and the way paved for catarrhal inflammation. The majority of the patients he has been called upon to treat have been otherwise healthy, robust persons. From this fact he does not favor the idea of the diseases being dependent upon constitutional derangement. It is, however, a well-known fact that these are the very class of people who, when irritation is once set up in their systems, present the most

aggravated cases, by reason of their superfluous vitality. He says he has occasionally met with cases where the local condition was evidently aggravated by constitutional derangement, and a cure was thereby retarded. The great majority of cases, however, have shown no indication of constitutional predisposition; but have pointed unerringly to local irritation, by means of which the function of the mucous membrane had been destroyed." Syphilis and other allied affections may engraft themselves upon the gums without a predisposition of the parts toward an inflammatory condition, and having disturbed the normal status of the gingival margins, they pave the way for subsequent disease in the alveolus. Certain drugs, such as mercury, phosphorus, lead, etc., have a known deleterious action upon the ligamentous attachment of the teeth.

Symptomatology.—In idiopathic inflammations affecting the gums, little or no constitutional symptoms are present, owing to the peculiar character of the tissues in which the disease is seated. The common features of inflammation are present, viz., redness, heat, pain (amounting to great tenderness in some instances), swelling. The latter, however, is generally rather slight because of the small capacity of the tissues for congestion; and hence the greater tenseness and consequent tenderness of the gums. In the symptomatic form of stomatitis there are present constitutional as well as localized symptoms, dependent upon the fact that the local disease is the result of a constitutional vice. In both varieties the quantity of saliva is markedly increased. This is also to be remarked in persons presenting a catarrhal tendency, even when no active catarrhal condition is present. The mucous membrane of the mouth, in such cases, has a juicy appearance. The salivary glands also seem to be more or less affected, and when stimulated by the application of the rubber dam will flood the operator with a perfect stream of saliva. The gums in these cases bleed upon the slightest touch, and the breath has a peculiarly offensive odor. More or less tartar collects around the teeth, and is in most cases serumic in character, being the result of the inflammatory action.

Black,⁸ Chicago, divides the tartar found in "the mouth into two classes,—salivary and serumic. Allen⁸ says that these meet all the needs of a general classification, although they sometimes are seen to merge into one another; and that occasionally an apparent third or even a fourth variety might be made out.

Salivary tartar is confined most commonly in its deposition to the lingual faces of the inferior incisors and to the buccal faces of the inferior molar teeth. The serumic form is always deposited on the roots of the teeth, from the neck, just under the free margin of the gingivæ, even as far as the apex of the root, not continuously, but in foci comparing to the local points of inflammation. It may sometimes be detected in its incipency by careful manipulation. The changes in the color or general appearance of the margins of the gums are seldom noticeable in the early stages of the disease, although very marked later on. The first deposits are colorless, but become dark brown as they grow thicker. Although the tartar is easily detached in the beginning of its deposition, it becomes much more firmly adherent as it gains in thickness."

Treatment.—The first step toward treatment should consist in determining the etiology in the particular case. If it lies in mechanical irritation from the deposits of tartar, then this local cause of irritation should be thoroughly removed with scalers. If the disease is the local expression of a constitutional vice, such as syphilis, tuberculosis, mercury, or potassium, treatment should be constitutional as well as local in character. In any event, local treatment should always be applied. The mouth should be put in the very best hygienic condition possible. Antiphlogistic remedies should be used in the form of mouth washes, etc. If the disease has passed the acute catarrhal stage and presents itself as a chronic catarrhal process, then mildly stimulating applications may be used, such as Black's "1-2-3" mixture, consisting of ol. cinnamon 1 part, acid. carbol. (crys.) 2 parts, ol. gaulther. 3 parts; applied directly to the dried gums. If the disease has taken on a purulent form, known as phagedenic, then germicidal treatment must be adopted. Harlan suggests iodol combined with terebine. Aromatic sulphuric acid, diluted, injected into the pockets, has proven efficacious in our hands; and now we have, what no doubt will prove an excellent remedy,—Hg. bichlorid. 1 part, acid. tartar. 5 parts, aqua, 1000; or acid. carbol. 50, acid. hydrochlor. 10, ether. sulph. 100, aqua 1000; or ether. sulph. 10, acid. hydrochlor. 10, Hg. bichlorid. 1, ol. oliv. 1000; to be applied locally to the pockets, which are to be kept free from saliva for ten minutes by the aid of napkins.

PULPITIS.

Pulpitis is an inflammation of the organic portion of a tooth, this comprising the so-called dental pulp and the fibrillæ that extend into the dentinal canals. In a normal condition the terminal points of the dentinal fibrillæ are covered by the enamel layer, which serves both as a coat-of-mail to protect the softer parts beneath, and as a masticating surface. The pulp in a normally developed tooth is seldom the subject of inflammatory action; and though this body is not essential for the retention of a tooth in the jaw, yet the first step toward the death of a tooth is a pulpitis.

Decay may mar the symmetry of a tooth, and lessen its usefulness as a masticating organ; but only as the pulp or its appendages are infringed upon is the vitality of the organ affected.

Etiology.—In considering the retrograde changes in the pulp, it may be well to take up the causes predisposing to decay, since it is the principal factor in producing inflammatory action in the pulp. A predisposing agent is found in heredity producing teeth that are either malformed or poorly calcified. Form alone may act as a predisposing agent: the much exposed faces of very wide teeth present a larger surface to the action of decalcifying agents. Irregular teeth are hard to keep clean, and are consequently prone to decay. The part played by heredity in the arrangement of the dental arch is too well known to need consideration. Its influence on the form of the individual organs is presented by Alton Thompson,⁹ of Topeka, Kan., who says that “the relation to malformation of the teeth concerns a disturbance of function; and that this disturbance results, through parental impression, in a defective dental development.”

Arrest of development or an insufficient supply of nutrition results in imperfect calcification of the dental organs, thus exposing more or less organic structure to the destroying agents, as we have pointed out in previous writings on this subject. In the degree that the organic tissues, either living or fixed, are exposed to the fluids of the mouth is the tooth pathological. The etiology and effect of these conditions of faulty development are given in an original paper on the “Dental Pulp,” by Hodgkin, of Washington, D.C.:—

“Points of calcification occur in enamel, but with no cartilage

to perform its function, as in bone. In fact, coalescence of the converging tracts in enamel is practically unknown; and if the gradual spreading of the tract is interfered with by some disturbance of function, coalescence is prevented, and a more or less marked 'fault' is formed. These faults of the enamel invite the attacks of dental decay, and form a good lodgment for impacted food, vitiated fluids, and the like. Here they decompose and initiate the work of destruction."

Decay beginning in these imperfect sulci soon exerts a deleterious action on the pulp; either by destroying the normal covering of the dentine, and thus allowing thermal changes to act more readily on the dentinal fibrillæ, or by permitting chemical agents to come into direct contact with the organic portions of the tooth, thus producing an inflammatory condition in the pulp. The *membrana eboris* persists throughout the life of the tooth, and when stimulated by encroaching decay forms layers of secondary dentine.

The manner in which the inflammation is transmitted to the pulp is thus described by Hodgkin: "Dentine is pierced by innumerable canals filled with a substance which is, in some sense, a prolongation of the pulp proper. This substance has sensibility and is susceptible to a certain sort of inflammatory action, and of stimulation to an abnormal activity. Evidences of its functional powers are: increased sensibility to pressure or injury; response to irritants, such as cold or heat, and still another, so far unexplained, —pain from the contact of sweets. In this article the substance is assumed to be protoplasmic. When the resistance is slight or *nil*, the decay progresses toward the pulp cavity. Prior to this, however, many changes may occur in that cavity, such as the deposit of nodules of dentine-pulp stones; a thickening of the pulp walls, thus lessening the size of the pulp cavity; or even such irritation as may result in inflammation and death of that very vascular organ."

Having thus presented the etiology of pulpitis, as arising from decay, we shall now consider its pathology. In an original paper on "Pulp Lesions," for the *ANNUAL*, Morsman says: "Pulp exposure is a condition, not a disease; but it is a condition demanding a remedy, and as such it must be recognized. As the sequelæ of simple diseases sometimes become matters of severe

anxiety, so this sequel of caries becomes a matter of great importance, overshadowing the primary disease and its treatment, because of the certainty existing that only by properly meeting this complication can any treatment be successful. So when any actual exposure of a pulp occurs, it is in a pathological state, though it may be in itself normal. This condition, then, belongs to the pathology of the organ. The shape of the pulp is nearly uniform in each of the various kinds of teeth, and this shape should be familiar to all operators; for it will govern to a great extent the appearance that a case of exposure may present, and will enable him to tell when such exposure is not likely to occur.

"Inflammation of the pulp presents itself in ways so various that it almost seems as if pulpitis were capable of simulating many different diseases. The first remove from normality in an exposed pulp is when, responsive to thermal changes, pressure and its unnatural surroundings, there is an increased influx of blood and an irritability marked by pain of long or short duration, spasmodic, and of increasing severity. This is called the stage of irritation. The ashy color of the pulp has given place to a pinkish tinge, which gradually becomes deeper until the dark red of congestion is reached.

"Irritation here is similar to irritation in other parts of the body, but the amount of tissue involved is so small that symptoms are not well marked. The extreme sensitiveness of the pulp and its unyielding walls tend to make most painful this stage, and that of congestion immediately following. The ache of a pulp is rarely continuous, but at intervals or spasmodic. Cold air or drinks, pressure from mastication, or any irritation, produce exacerbations. This period is usually not of long duration; but it may last for weeks, or even months. Though resolution rarely occurs, nature often makes an attempt, as is shown by the calcification sometimes of a very large part of the organ, for it is always in this stage that calcification occurs. Circulation gradually becomes more rapid and the capillaries become engorged with blood. A dull, throbbing pain results. The pain is relieved by cold applications, but aggravated by hot ones. Nocturnal pain is most frequent, due to the horizontal position of the body. The disease either runs its course, ending in suppuration, or a condition of chronic inflammation intervenes by which the death of the pulp results, the bulbous portion dying first, followed by the root portion of the nerve."

While this is the typical course, variations are numerous. It is not uncommon to see a pulp remain for days in an irritable and painful condition, congested almost purple, bleeding readily and copiously, and aching severely if unprotected.

Diagnosis.—The differential diagnosis of partial or complete pulp exposure is not easy, and it is best made by exclusion. The many contradictory claims regarding the conservation of the dental pulp arise from a lack of understanding as to what condition is to be considered as an exposure.

The treatment depends upon an accurate diagnosis. If we are to put in the same category all cases in which the pulp is uncovered, whether by instrumentation or decay, then there must arise confusion as to results. We are led to believe that the most marked successes in the treatment of exposed pulp have been in those cases in which the exposure was made by instrumentation, and in which so slight a condition of pulpitis existed that the pulp might be called healthy. In such cases the pulp ought not to have been exposed.

Morsman says in the article we have quoted above: "In the clinical history of the case there may or may not have been pain. Its existence indicates that the pulp has become pathological more frequently than the condition of mere exposure which we are now considering. Pain upon pressure and suction are sometimes present, but not always, because of the overlying decalcified dentine or débris present in almost all pulp lesions. The same may be said of cold air and drinks; they indicate pulp lesions, but do not differentiate. In careful hands the probe is a ready means of determining that exposure exists. The difficulty does not lie in the diagnosis of exposure, but in the differentiation between the conditions of simple exposure and those inflammatory lesions which become in a short time sequences of exposure; and this is important, on account of the treatment."

Treatment.—Treatment must be based not only upon the condition of the pulp at the time it comes under observation, but also upon the history. If the patient gives an account of odontalgia, even if there be none at the time the tooth comes under our notice, we should regard it with suspicion, though willing to give it a chance under a temporary filling. If it has been exposed by instrumentation and does not give a history of previous trouble, it

may be capped at once. But when any considerable amount of congestion is observed at the time of treatment, capping is a doubtful procedure. According to Hodgkin, "Many eminent practitioners tabulate successes, in spite of the fact that an apparent present success may remotely prove a failure. Under capping, pulps may remain quiescent for a number of years, and then give unmistakable signs of succumbing to the devitalizing process. We know that a pulp may become exposed, may become hypertrophied and fungous, and remain in this singular state of low grade vitality a long time. It is here almost insensible to pain; yet it retains life, seemingly the more persistent for being of a low grade. It is possible that some of the cases of supposed successful capping may assume this fungous state, to perish in the end." In those cases in which capping is thought injudicious, devitalization should be resorted to. This may be accomplished by several means too well known to need consideration here. The following case is cited by Morsman to show the longevity of a pulp under the direct action of even so powerful an agent as arsenic: "P. H. Mc., male, æt. 30, of large physique and strong constitution; presented with a complicated caries of lower right second molar. Odontalgia was slight, but was increased by heat or cold. Diagnosis,—initial stage of pulpitis. Arsenic was applied; patient returned the next morning, complaining of severe pain in the tooth. This was quieted by oil of cloves. Patient returned after eight months with severe odontalgia in the same tooth. That was relieved by application of creosote to exposed pulp; relief lasting for six hours. On removing the application profuse bleeding occurred, accompanied by paroxysms of severe pain. Syringing with lukewarm water finally gave relief; oil of cloves was then applied, giving freedom from pain for twenty-four hours. The pain and bleeding returned when the application was removed. This condition continued for seven days, relief being obtained only by daily applications, pain and blood each time following their removal. On the eighth day there was neither pain nor bleeding, and arsenic was applied. The remains of the pulp were removed the second day afterward; there was no pain in the interval. As the pulp was removed in fragments no examination could be made."

From many similar experiences, Morsman is led to infer that the chronic inflammatory condition arose from a premature application

of the devitalizing agent in the first instance. The inflammation should have been reduced some time before the arsenic was applied. On the other hand, our experience had led us to attribute failure in such cases to the fact that the cavities were not sealed tight enough. Arsenic acts, not as an escharotic, but as an irritant; and the pulp dies from congestion. Therefore, we have always considered it good practice, when arsenic has been applied, to seal in the pulp with gutta-percha or gum sandarac,—preferably the former.

If not interfered with, pulpitis results, sooner or later, in death of the pulp. This is generally accompanied by the formation of pus. We believe with Morsman that gangrene of a pulp, if ever present, is at most of very seldom occurrence.

When the deviation from the standard of health is not too great, inflammation of the dental pulp results in the development of secondary dentine or pulp nodules. The manner of their formation has received considerable attention during the past year, and for a better understanding of the subject the persistent growing tusks of the elephant have been studied.

Fletcher, of Cincinnati, presents the following original communication. Among other etiological agents, he discusses caries; but only as an exciting cause of new growths. "The wearing away of the crown of a tooth of persistent growth is normal, but abrasion in human teeth is frequently the cause of their loss, through the destruction of the pulp by the formation of new growths in the pulp chamber. Erosion, the rubbing of clasps or plates against the dentine, and fillings through thermal changes, may also be exciting causes of new growths. In fact, any thing which constantly irritates the distal ends of the dentinal fibrils may be the cause of new growths. These growths from the beginning may take any of the forms known, from a thin layer of protective dentine to an almost complete filling of the pulp chamber. Traumatism may also serve as an etiological agent; teeth may be fractured and the sides reunited. Owen, in his 'Odontography,' Plate 142, pictures such a case in a tusk of a hippopotamus; and other authors give similar instances of repair. In the elephant's tusk there are numerous examples of fractures and gunshot wounds in the neighborhood of the pulp, causing interesting new growths. Abscesses may form in the pulp from the same excitants that would produce a like result in

any other part of the body. This is especially the case in teeth of persistent growth. Their pulps are large and very vascular, and are consequently more subject to abscesses or other disturbances than teeth of limited growth, where the apical foramen is small and the vascular supply comparatively less."

These disturbances give rise to what are known as *pathological zones*. Irregular territories of dentine are formed in the substance of the ivory and represent former disarrangements of the functions of the pulp. At these places the tubules are twisted and turned in many directions. Their calibre is often increased in size; and at times osteo-dentine is formed, with the dentinal tubules radiating from a large central lacuna, like the canaliculi of bone. Later, however, the tubules assume their customary position, and the formation again becomes regular, showing that the odontoblasts have resumed their normal position and function. Such zones are generally found nearest the periphery of the dentine. Drs. Bödecker and Heitzman, in an article entitled "Eburnitis,"¹⁰ say, with respect to these zones: "Aside from these secondary forms of inflammation there occurs a primary inflammation in dentine, independent of pulpitis or pericementitis, running its course in the middle of the dental tissue, and leading either to new formation or to destruction by suppuration." Again: "though others have claimed that an abscess in dentine must have formed originally in connection with the pulp tissue, and afterward have been separated from the latter, we again deny any such occurrences, since we admit the possibility of the formation of a primary abscess in dentine, independently of the pulp tissue." They quote Wedl and Albrecht as claiming "the presence of blood-vessels, presumably grown into the dentine from the pulp, for an absolute necessity in cases of abscess in dentine." Dr. Fletcher, continuing, says: "The theories of Wedl and Albrecht are probably true, since a formation of pus in dentine without blood-vessels is in direct variance with all known laws of inflammation. Suppuration and abscesses suggest the presence of pus. One of the essential constituents of pus is leucocytes, and the formation of pus in the middle of the dental tissue would seem impossible,—since these cells measure, according to Greene, about $\frac{1}{3000}$ of an inch in diameter, and the dentinal tubules, according to Owen, about $\frac{1}{30000}$ of an inch. In addition to this discrepancy between the

sizes of the cells and the tubes, the lumen of the tubes is already taken up by the dentinal fibrils.

“For these physical reasons it seems impossible to have a formation of pus in dentine. The breaking apart of medullary corpuscles “does not form pus, even admitting that they are formed in the tubuli in this condition. The fact that leucocytes migrate freely through the soft, flexible walls of the blood-vessels is no proof that they could inhabit the hard, unyielding dentinal tubes.” “Now, since the presence of blood-vessels and the constituents of that fluid are necessary to the process of absorption and repair of animal tissues, it is evident that these pathological zones of dentine must have been formed when the zone was at the periphery of the pulp; having been produced by a disturbance of the odontoblasts at that point, instead of forming in the middle of the dental tissue, as claimed by Bödecker and Heitzman.”

New growths of the pulp and pulp chamber are of two classes: those which fasten themselves to the inner wall of the pulp chamber,—adherent; and those which are formed in the pulp itself,—free nodules. The writer suggests the following division of these growths, in order to simplify their classification:—

Secondary growths of dentine, to include: (1) Protective dentine. (2) General deposit of dentine within the pulp chamber. (3) Dental tumors either within or without the pulp chamber. (4) Pulp nodules of dentine. (5) The unorganized calciferous deposits found in the pulp cavity.

After the odontoblasts have formed the dentine in a tooth of limited growth, they lie comparatively inactive for long periods of time, but may again be excited into action to form new dentine by the application of the proper stimulus, and this may occur at any time, so long as the pulp retains its full vitality. The product under these circumstances is different from the normal dentine, being more translucent from a paucity of tubes. The courses of these tubes are quite irregular, but their tendency is to be at an angle to the regular tubes. All such formations, however, are at the expense of the pulp itself; for they gradually fill the pulp chamber. But in teeth of persistent growth almost the reverse is true; for while the tooth is worn off at the apex as rapidly as it is formed, any cavity in the ivory or tumor which may have shown

in the pulp chamber will ultimately pass out beyond, and the pulp will resume its normal size and shape.

Dr. Fletcher, in further discussing the subject, says: "Leaving out of this discussion all new growths of the pulp chamber but the adherent, we take up first that of protective dentine,—a name applicable to that particular form of new growth designed to protect the pulp from an enemy, or from such processes as would endanger by exposure the life of that organ. This growth is found abundantly in deciduous teeth, where they are retained up to or past their normal life.

"The odontoblasts are here brought into action by the exposure of the peripheral ends of their fibrils to some irritant. This irritant may be any thing which is continuously present; such as a filling, clasps, abrasion, decay, erosion, and the like. The growth is found to appear first in the pulp chamber, near those odontoblasts the fibrils of which have been irritated. If it be an abrasion, that horn of the pulp chamber nearest the irritant is the first place to show the new growth. If it be decay or any other progressive lesion, the growth proceeds in proportion to the progress of the lesion, providing it be not too rapid. This is the case up to a certain point; after which the whole membrana eboris becomes excited to an abnormal amount of work, and there results a general deposit of dentine throughout the pulp chamber. These new growths cause the death of the pulp; probably through disease of the walls of the arterioles, impairing their elasticity, and consequently the circulation. If these pulp chambers were widely open at the limit of the root, as is the case in teeth of persistent growth, complete calcification of the pulp chamber might be possible; but as such is not the case, more or less space is found after the death of the pulp. Since the pulp chamber of a tooth of persistent growth is larger at the extreme limit of the root, the circulation in its pulp could be interfered with in only a comparatively small zone, because the more abundant collateral circulation would keep up the necessary blood supply. But in a fully developed tooth of limited growth, the apical foramen is large enough for only one or two arterioles, in addition to the nerves and veins necessary to the life of the pulp. Hence when it is attacked by any considerable amount of inflammation, we may easily have death of that organ from vascular stasis.

“New growths in human teeth are the product of a low grade of inflammation: in the elephant’s tusk, however, there are evidences of very violent inflammation with copious discharges of pus, followed by successful efforts at reparation. The pulp in these cases seems very tenacious of life, and recovers from the most severe wounds; whereas suppuration of the pulp of the human tooth is almost sure to result in the destruction of the pulp.

“It is probably not uncommon for the pulps of teeth of persistent growth to suffer from abscesses produced by the same excitants which would cause a similar result in like tissues of other parts of the body; but, as a rule, traumatic injuries are the causes of inflammation in these teeth.

“The elephant’s tusks are used as weapons of defence, and when we consider the great strength and weight of the animal, it seems strange that they are not more often loosened in their sockets, or broken. The pulp cavity being concave, of funnel shape, the upper or thinnest portion may be fractured, or the upper edge forced inward, this also implying a wound of the pulp that would end in inflammation. When such inflammation terminates in suppuration the pus would gravitate toward the apex, and, not being able to force an exit through the dense walls of the tusk and its surrounding alveolar process, would thus form a small zone of suppurating tissue. In these cases there may be an extension of the trouble, until large zones of the pulp are involved, and the odontoblastic layer is forced away from the already formed ivory. These cells, however, do not cease to perform their functions; but form an inner plate of ivory at the point where they are held by the collection of fluid.

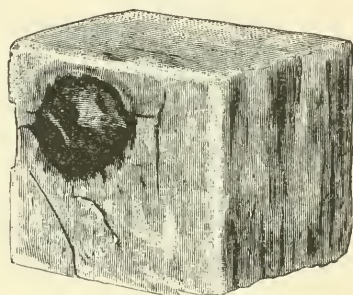


FIG. 1.—LEADEN BULLET INCASED IN TUSK.

“Fig. 1 represents a lead bullet completely encased as described by Owen. In this instance the lead ball made much less disturbance than an iron ball would have done. The difference in the effects of the two metals may be seen by comparing Figs. 1 and 2. In the first, only a comparatively small zone has been involved in the encasing of the bullet, the vaso-dentine extending

but a short distance in any direction, and with no evidence of the formation of pus.

"The ball must have penetrated the ivory on the inner side of the pulp chamber, opposite the point of entrance, and then passed through the pulp. It is not far from the external surface; and, since the cementum is intact, the ball could not have been far out of the alveolus, or the cementum would have been worn away.

"Fig. 2 represents an iron ball enclosed in what was evidently a pus cavity; and it probably would not have become solidly encased, since the pulp was rapidly building a complete wall between the ball and itself; and after this separation no more formation of dentine could have occurred, except on the pulp side of the

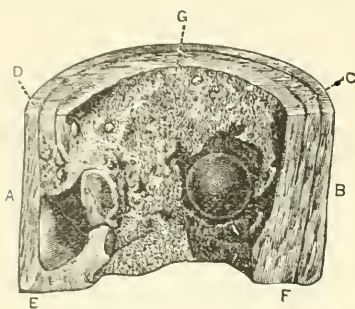


FIG. 2.—The ball passed from A to B behind the bridge of ivory G. D shows the outer layer of ivory, c the inner.

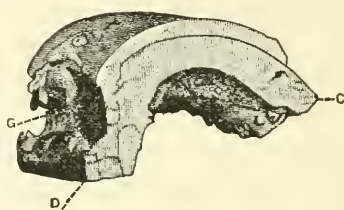


FIG. 3.—G, Entrance of ball, which passed from G to C. The bridge of ivory is seen on the concave side of the specimen.

separating partition. It seems that this ball had gravitated in a spiral direction from its point of entrance, until the pulp finally succeeded in building a barrier to its farther progress. Probably the point of entrance of this ball formed an exit for the pus, though having nothing but the specimen to judge from, one cannot tell what might have been learned from seeing the whole tusk. However, the point of entrance was evidently some distance above the place where the ball is now situated, and it may have entered from the top of the chamber and have gravitated to this point; but most likely it was shot through the wall at some distance above its present position. This specimen, as well as Fig. 2, has numerous tubercles or projections in 'stalactite' form. On section, these tubercles appear to have formed small blood-vessels, since what may be taken for remnants of these vessels can be found

near the centres of the tubules, with the tubuli radiating from them as they do about the vessels in a pulp nodule.

"The cementum on the external surface of both specimens (Figs. 2 and 3) shows evidences of a slight disturbance of the formative organ of that tissue. There is a series of rugæ or rings running around the tusks immediately opposite the pus cavity within, showing that the internal inflammation was not without its influence upon the tissue without."

ABSCESS CAVITIES.

Busch, of Berlin, in a paper read before the Oral Section of the Ninth International Medical Congress, at Washington, discussed the probability of the formation of abscess cavities in dentine. In explaining a specimen of elephant's tusk, which he designated as No. 20, and in which there was a cavity, 8 cm. in length and 4 cm. in circumference, enclosed in otherwise healthy ivory, he said "that the cavity could not have been formed by absorption of the previously healthy tissue, as it was not connected with the vascular supply. The explanation is found in a separation from the pulp cavity by the normal growth of the tusk. At one time this cavity was connected with the pulp, but it finally became enclosed. As a rule, tusks in which there are cavities or nodules present no external marks of malformation; but there is an encroachment upon the pulp cavity by an inward bulging of the inner wall. In some instances cavities can be traced to alveolar abscesses which result in a malformation of the developing tusk, when the normal configuration of the external as well as the internal surface may be disturbed. These changes were shown by specimens in some of which the opening was external, and many fine spicula were noticed projecting into the cavity. The evidences of sympathetic or direct extension to the pulp of the inflammatory condition of the periosteum were seen in projecting excrescences that impinged upon the pulp." Busch further says that "abscess cavities thus formed may be carried downward by the growth of the tusk, and are marked by internal bulging of the internal layer."

Such a condition was shown in four of his specimens. The expression was always the same; the inner wall was curved inward, and encroached upon the cavity of the pulp. The internal

surface of the cavity may be smooth, or rough and jagged. Specimen No. 20 showed the manner in which fractures in tusks were repaired. With regard to this subject, Busch said that the fracture in this instance evidently extended into the alveolar portion of the tusk. The sides of the fracture were united by a "bridge" of secondary deposition, which impinged upon the cavity of the pulp, thus showing its origin and the manner of union.

The editor discussed the question of the formation of nodules and cavities in ivory, before the First District Dental Society of New York. His conclusions have been substantiated by Dr. Fletcher's paper. Regarding the repair in cases of purely traumatic lesions, he states that the most common occurring in tusks are complete fractures, and it is surprising how many broken pieces of tusks may be found in stock. This is accounted for by the dealers in the fact that elephants use their tusks as instruments of defence, which is also the principal cause of splitting, though this condition is not as frequent as fracture. The consolidated end of a tusk is not easily broken, but when we take into consideration the immense strength of the elephant, it is not so remarkable that it sometimes occurs, and even more frequently than it does. The tusks are also often fractured by being struck by rifle-balls. It is impossible for a rifle-ball to enter the solid shaft of a tusk; consequently, when balls are found imbedded in the substance of the solid tissue, they must necessarily have penetrated the tusk at its base, and been carried outward by the growth of the tusk, or else penetrated into the pulp cavity when the tusk was composed of a thin shell, and afterward been built into the tusk by the development of ivory,—pathological at first, and afterward normal, provided such a layer exists. This point seems to have been entirely overlooked by those who have discussed the question; but it is worthy of remark and emphasis in the discussion of fractures.

The longitudinal split seen in Fig. 4 evidently occurred when the formed layer of ivory was perhaps not more than one centimetre thick. The pulp immediately made an attempt to repair the fracture, as evidenced by the pathological layer occupying both sides of the crack. On account, no doubt, of the constant motion of the two sides, union did not occur until the crack had increased to the depth of $1\frac{1}{2}$ centimetres. No healing, however, took place until there was an exalted and highly stimulated

condition of the formative cells along the entire line of the fissure, as verified by the heavy ridge which encroaches upon the pulp cavity.

The fracture in this particular instance was nearly two feet in length, being deepest at the end toward the apex. Here we find repair after fracture of solid ivory, not by union of the fractured walls, but by an internal bridge which extended across the line of fracture. The reactive ability of dentine is always expressed upon the surface of the pulp, which is the formative organ. A better illustration of the point in hand could not be furnished.

Positive evidence that the mobility of the walls of the fracture had much to do with its apparent depth is seen at the thinnest end of the specimen, where the line of fracture extends into the bridge of repair.

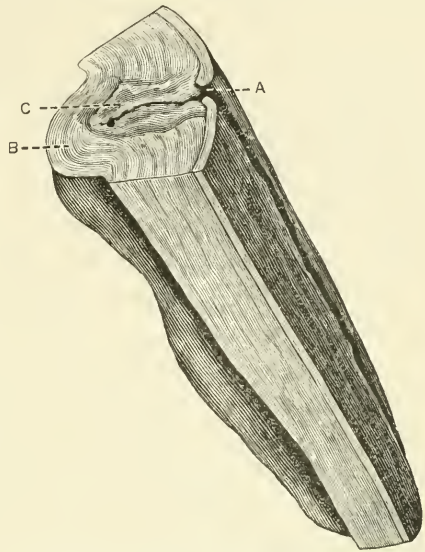


FIG. 4.—A, LONGITUDINAL SPLIT; B, INNER LAYER NORMAL IVORY; C, PATHOLOGICAL IVORY.

DENTAL THERAPEUTICS.

Marked advancement has been made in dental therapeutics during the past year, especially in the direction of antiseptics. We are beginning to understand the etiology of sepsis better, and are hence better able to use prophylactic treatments. The field of dental therapeutics is rapidly settling down to a sensible basis. The day of empiricism in dentistry, as well as in medicine, is being deposed by healthy experimentation in therapeutics, based upon a better knowledge of the etiology of disease.

Besides the general remedies that have long been in use, there are now many new local ones, mainly antiseptics and obtundants. We have gone a step farther in the last few years. From directing our efforts toward neutralizing the often found acid condition of the saliva, we now turn our attention to the main acid-producing cause in the mouth, viz., micro-organisms. As a natural result,

the formulas for tooth powders and washes have had added to them some germicide; and the most popular canal dressings take the same direction. Ideas of what good hygienic conditions are have been materially modified. Now every thing is unhygienic that we do not know to be microscopically clean and free from organic properties. The microscope and culture oven have been installed by the side of the retort and the scales in the chemical laboratory; and the result of their combined analyses is operating to give us a more rational line of therapeutical agents. To the efforts of no man are we more indebted than to Prof. Miller, of Berlin.

Leffman,¹¹ in a paper before the Odontological Society of Pennsylvania, discussed naphthaline, salol, iodol, and thymol, and the most recent antiseptic, saccharine, the sugar substitute, which is now said to be an excellent antiseptic, and to be entirely harmless. He thinks, however, that there is great reason to doubt if any of these bodies are, in the true meaning of the term, germicides or antiseptics in the degree of concentration in which they are used. Doubtless still fewer will be found to be sporicides. "Their action is inhibitory only; they prevent germ development only when they are actually present. Some years ago Mr. Winter Blythe, of England, showed that this was true even of some of the more powerful and recognized agents, and still more must it be true of those of feebler intensity. Several formulæ for antiseptic tooth washes have been offered as fulfilling the indications here referred to; and with a view of testing the practical value of these, he made up two forms and presented them for consideration by the members. In his opinion they are both rather too strong, and can only be used very much diluted with water. This will of course interfere greatly with their antiseptic effect. Besides this they are necessarily retained in the mouth for a very short period; and even if we suppose that they penetrate to all parts, they do not remain long enough to do any good." Appended are the two formulæ, both of which Dr. Leffman has used, and found the first the more agreeable of the two: \mathcal{R} thymol, 4 grains; benzoic acid, 45 grains; eucalyptol, 220 grains; alcohol, 3 fluidounces; oil of wintergreen, 25 drops. Use a teaspoonful in about three tablespoonfuls of water as a wash. \mathcal{R} thymol, 20 grains; alcohol, 1 fluidounce; glycerine, 1 fluidounce; water enough to make one pint. Use as above.

Of iodol, Harlan, of Chicago, before the Mississippi Valley Association of Dental Surgeons, said that it was largely supplanting iodoform, on account of its less pungent odor. He uses it combined with pure terebene as a topical application to lacerated edges of the gums, after removal of necrosed bone. It is also beneficial in the treatment of pyorrhœa alveolus, and forms a good substitute for iodoform. Combined with oleum gaultheriæ, it forms an excellent antiseptic in root canals, destroying the odor of the foulest pulp canal in two or three days. It has a decided demulcent effect when applied to indurated mucous membranes. It acts happily upon exposed pulp, controlling the pain almost instantaneously.

In addition to the above, Harlan suggests aseptol, eucalyptol and trichlorphenol. Of the first, there can be no doubt of its germicidal properties. It is an oily liquid, freely soluble in water, and has an acid reaction. It is a local stimulant, and serves as an excellent medicament when largely diluted ($1-10 \div 40$) for injection into the pockets in pyorrhœa; and for use in the treatment of abscesses, either through the root canals or fistulous openings, if such exist. It also makes a good obtundant when applied locally to exposed pulps. Combined with ol. caryophilli it forms an anodyne and local stimulant. Harlan also gives the following formula for an obtundant paste: \mathcal{R} acidi salicylici, grms. 6; acidi carbolici crys., grms. 2; eucalyptol, grms. 1.—M. Apply locally after having dried the parts thoroughly. It makes a thick paste that will adhere quite tenaciously to the necks of the teeth or to the gums, and has been found efficacious in obtunding sensitive dentine, especially at the cervical borders. It is a fairly good antiseptic. Trichlorphenol contains three atoms of chlorine in place of hydrogen in carboic acid. It is not soluble in water, but freely so in alcohol, ether, essential oils, glycerine, etc. The objection found to it lies in its non-solubility in water. It makes, however, a good non-irritating germicide in combination with glycerine or the essential oils. Harlan suggests that it may be of use in the treatment of pyorrhœa, because of its readiness to form soluble salts with the bases. Speaking of salol and some others, he says: "Where crystals of salol are applied to the living pulp they cause no pain, being non-irritating, yet will destroy all kinds of microbes and will asept wounds. The dose is from two

grains to two drachms. Lanoline does not become rancid, and cocaine or other substances can be mixed with it. For obtunding, menthol is good, or menthol and thymol crystals equal parts, menthol and absolute phenol, two parts menthol, one of carbolic acid and one of chloral hydrate. They are all good local anæsthetics, and do not leave an eschar."

Laplace,¹² New Orleans, publishes the report of a line of experiments upon acid sublimate solutions. He found that corrosive sublimate solutions, when brought into contact with albuminous matter, formed an albuminate that materially vitiated its antiseptic properties. The result of his experiments upon sublimate solutions, to which blood-serum has been added, led him to conclude that no matter how efficacious a disinfectant bichloride was when used in fluids containing no albumin, yet when brought into contact with albuminous matter it may prove of much less value. When, however, he added 5 parts HCl to the sublimate 1-1000, the albuminous precipitate was not formed and the solution proved as valuable an antiseptic for wounds as for instruments. The irritating effect of HCl led him to try tartaric acid, which he found to operate equally as well, no precipitate being formed. He suggests the following formula: cor. sublimate, 1.00; acid tartar., 5.00; aqua, 1000.00, for syringing out cavities or bathing wounds. For antiseptic dressings, cor. sublimate, 5.00; acid tartar., 20.00; aqua, 1000. Soak gauze, sponge or lint in fluid for two hours, press out and dry. He also found by his experiments that carbolic acid, when used in the following manner, was a far more active disinfectant: 5 per cent. carbolic acid, 10 per cent. com. ether, 1 per cent. HCl. The acid has the same effect on the carbolic acid as it has on the sublimate solution. These researches have especial interest to the dental profession, as these two solutions can now be used in pulp canals without coagulating the albumin found therein.

Truman,¹³ of Philadelphia, presents the following excellent recapitulation of his personal contributions to dental therapeutics during the past year:—

iodoform and arsenious acid.

"The use of arsenious acid has been attended with many difficulties, where the devitalization of the pulp was attempted;

and yet, since Spooner introduced this agent, in 1836, there has been nothing to equal it for this purpose. The peculiar action of this agent, in first paralyzing, and then, by absorption, continuing its toxic influence to an extent limited only by the amount used, has made it of special value where devitalization was regarded as necessary. While its operation, in most cases, was entirely satisfactory, this could not be stated as a universal experience. The reason is quite obvious, when it is understood that in all hyperæsthetic conditions of the pulp there is a resisting power in the tissue itself. In pulpitis, therefore, the results have ordinarily been a great increase of pain, and failure to effect the devitalization. The resisting power of an inflamed surface is nowhere better illustrated than in an application to a congested pulp. This action may be explained by the well-known fact that pressure of fluids on one side of a membrane tends to prevent the passage of fluids or substances in solution upon the other side.

“It is well known that in ordinary exposures, the irritation, after the application of the arsenical paste, is usually continued for one hour and then will suddenly cease. Various reasons have been given for this cessation, such as destruction of the surface and relief from pressure, and pressure itself has been presumed to be the active agent in the production of pain. This seemed to me not only unreasonable, but an unscientific explanation. The pain is produced when the greatest amount of care is taken to avoid pressure; and this latter can be held responsible to only a limited degree for the pain experienced. The explanation must be looked for elsewhere. My experience has taught me, from a long observation of pulps, that the first effect is, as before stated, to paralyze the sensory nerves; but this result is not attained without a previous period of excitement. It must be remembered, however, that this loss of sensibility is only the precursor of death, and is not absolute destruction of life in the tissue involved: this comes on by slow processes many hours subsequently. It is by no means certain that even with the absorption of arsenic that vitality will be destroyed, for he has repeatedly found a return of sensation after apparent death. These clinical observations are fully borne out by the observation of others. In frogs, according to Sklarek, but a short time is necessary before ‘the animal becomes completely paralyzed. Arsenic therefore paralyzes first sensation and reflex

action, and some time after voluntary power.' Ringer does not agree with Sklarek; for he found 'that sensation and reflex action persisted as long, or longer, than voluntary power. Sklarek attributes the general paralysis to the action of arsenious acid on the cord. My own experiments, conducted with Dr. Murrell, confirm this statement; but they show also that arsenious acid is a paralyzer of the motor and sensory nerves, and of the muscles; in fact, a protoplasmic poison, destroying the functional activity, first of the central nervous system, next of the nerves, and last of the muscles.' The consideration of the action of arsenic must not be confined to pulps or tissues in normal condition, as that may lead to erroneous conclusions. All exposed pulps are exposed to irritation from well understood causes: collection of food, micro-organisms, fermentation, and waste acid products. Very few can be said to be in a perfectly normal condition; and consequently all such pulps are a source of anxiety to the dentist. He is well aware that the longer they are left thus situated, will the certainty of resistance to the absorption of arsenic be increased. Any application will inevitably increase the surface excitement and have only one result,—that of continued and excruciating pain. This hyperæsthetic state will continue until the arsenical application is removed and an antidote applied. Examination of the pulp will show that not only is the organ not destroyed, but that sensation has been greatly increased. The application has been a failure, and the patient has suffered hours of agony uselessly. There is a possibility that the pulp has absorbed a minute quantity of the arsenic and will die in the course of two or three days. But even this favorable ending is by no means certain.

"Now, this is briefly the action of arsenic, as it has been observed in connection with pulps. It is not surprising, therefore, that the devitalizing process, through this agent, has fallen into disrepute, and that of 'capping the pulp' has largely taken its place. This process has now had a trial of years; indeed it may be said to have had two periods of trial, very distinct in their character. It was a method introduced long before arsenic was suggested, and was continued for some time thereafter. This was the first period, and the practice resulted in failure. The second began with the introduction of the oxychlorides and the oxyphosphates. While these have greatly aided, and in some cases

have successfully preserved, the pulp, and have even had the rare effect of producing secondary dentine formations, the results on the whole are very unsatisfactory. It is certainly true that the time is fast approaching when this practice will have to be abandoned, except in cases of fresh exposure and of extraordinary vitality in the individual.

"The next question to consider is, have we anything in our repertory of agents that will act more satisfactorily in the destruction of pulps than arsenic? Outside of the galvano-cautery and mechanical processes, there is nothing as yet discovered. The first of these is inconvenient and not painless, and the last is a barbaric mode of torture, which no enlightened operator would care to select. Escharotics, such as carbolic acid and chloride of zinc, are not admissible from their slow or too violent action. The uncertainty attending all agents suggested for this purpose has developed the rather remarkable fact that there is nothing that will give results equal to those of arsenic. There is a measure of uncertainty attending its application also; but this has been reduced to a minimum since we have become more familiarized with the conditions essential to its successful use. The extremely minute quantity required for devitalization makes it not only a very safe, but a convenient agent. It is hardly necessary at this time to combat the prejudices of the few very inexperienced individuals who have condemned it on the score of danger from possible toxic effects, as well as on account of the risk of the sloughing of tissue from contact. This can have no force when it is understood that the $\frac{1}{100}$ grain is quite sufficient to devitalize the pulp of the single-rooted teeth.

"Recognizing, then, the fact that we must return to the original mode of extirpation of the pulp, and that devitalization is not to be accomplished by any agent in the materia medica except arsenic, it becomes of vital importance to know how to use this to produce the least pain with the best possible results. The old mode is such a very familiar process that it need not be alluded to. The point to emphasize is that arsenious acid can be used in all cases of extreme inflammation of the pulp. That this is not possible under old modes of use must be apparent from what has previously been said; and hence we are forced either to abandon arsenic in such cases or resort to a combination of agents.

The well known and most valuable anæsthetic property of iodoform led Dr. Truman to use it in a severe case of pulpitis, in connection with arsenic. The result was so at variance with all previous experience that he immediately tested this combination through a series of cases, and with equally good results. He makes no claim to originality in the use of this agent in connection with arsenic for the devitalization of the pulp. Very early after its introduction it was used by the German dentists, both alone and in combination with arsenic.¹⁴ It is the anæsthetic property of iodoform that unquestionably overcomes the irritating first effects of the arsenic, and thus prevents pain and also invites or seems to aid the absorption of the arsenic to an extent that devitalization is assured, and that without any perceptible inconvenience to the patient. This peculiar and very important effect seems not to have been observed in this connection; and, as far as he is aware, iodoform has not been regarded as of any special value in the destruction of pulps, except by a few German investigators,—Schoff, Hagelberg, Skogsborg, and others named.

The importance of securing a combination with arsenic to overcome the resisting power of an inflamed surface, has led to experiment with other agents. Dr. E. C. Kirk¹⁵ recommends the formula of cocaine, hydrochlorat., acid. arsen., menthol cryst., and glycerine; but even with this apparently effective combination he has “not invariably succeeded in making devitalization a painless process.” The number of cases treated by combining iodoform with arsenious acid have been so satisfactory as to justify the opinion that the pulp can be devitalized while in a condition of inflammation; which would render the destruction with arsenic alone an impossibility. And this can be produced without a particle of pain. In no case treated has there been a variable result. In one instance the pulp resisted the action; but this, from well understood causes, is likely to be the case with a certain proportion of patients. The confirmatory evidence of the value of this combination, given by Dr. G. G. Milliken, of the Dental Department University of Pennsylvania, and also that of Dr. H. D. Hurlburt, of Geneva, Switzerland, will add some force to Dr. Truman’s assertions. Dr. Milliken reported that he had treated a number of cases of inflamed pulps without failure and without pain by the use of iodoform and arsenic. Dr. Hurlburt writes to Dr. Truman,

"Your article is a God-send to me, if the iodoform does as well in every case as it has since I read your article."

The mode of using these two articles is very simple. The usual precautions are adopted, of rubber dam, drying the cavity, etc. Then take the ordinary amount of arsenious acid, place it on a glass slide kept for the purpose, along with an equal quantity of iodoform; use a 5 per cent. solution of carbolic acid in sufficient quantity to make a paste; and carry the whole to the pulp on a piece of cotton the size of a pin-head. This should then be covered with a cap made of platinum, or, what is equally as good, red gutta-percha; then cover in the usual way. Instead of having from an hour to three hours' pain, according to the amount of inflammation, patients have not been conscious of any action whatever. If the time ever comes when we can save the pulp and keep it in full vitality, no one will rejoice more than the editor; but as that is at present an impossibility, the value of the suggestions given will be understood and appreciated.

The use of naphthol or hydronaphthol in dental practice is of comparatively recent date. Truman has used it almost to the exclusion of carbolic acid. It has been for a long period very desirable that an agent should be introduced to take the place of carbolic acid. Creosote and the latter have too long made our offices malodorous, so much so that the unpleasant odor of dental operating rooms has become proverbial. This could not be avoided in the hourly use of antiseptics of remarkable strength. While carbolic acid, eugenol, sanitas oil, eucalyptol, etc., cannot be dispensed with, they may be relegated to exceptional cases, and the inodorous as well as the most powerful antiseptics, such as mercuric chloride and hydronaphthol, be made use of. He has relied almost exclusively upon hydronaphthol in those difficult cases, decomposed pulps, and with such success that he thinks we can depend upon it with certainty, used as an injection; and, with cotton saturated with it, as a temporary stopping in canals. So much confidence has he in it that the cavity has been left for days with a cotton stopping, saturated with a solution of 1 to 500 of hydronaphthol, with no unpleasant results and with the cotton but slightly tainted. It has been used with great satisfaction in pyorrhœa alveolaris and in all forms of ulitis, or wherever the inhibition of micro-organisms was regarded as of importance; and

this will be found necessary in all cases of inflammation in the mouth. Used in strength, it is irritating, and hence it should be employed, except where a positive effect is desired, in comparatively weak solutions. Its value will be appreciated in the treatment of pulpitis in connection with pericementitis or the former alone in its earlier stages.

“Whether the claim made for it as a germicide be sustained or not, it certainly inhibits the development of micro-organisms, and this is quite as important in dental practice as destruction. With this idea it can be used and depended upon as a mouth wash; preserving the gums in a healthy state without danger, as far as known, to tooth structure. For this purpose we rank it superior to that most valuable agent, thymol. By inhibiting the growth of microbes, the danger of excessive and destructive inflammation may be avoided. In the use of these various germicides there is a prevailing and mistaken idea that the most powerful is the best to use. This may be true, as in the case of mercuric chloride, where it can be safely applied, and in much stronger solutions than ordinarily used; but it is not true where a decided effect is required and safety a question of moment. Especially must this be borne in mind in the treatment of inflammation of the gums.”

Basing his opinions upon the direct action of micro-organisms on diseases of the mouth, and the known properties of vegetable matter as a medium for the culture of micro-organisms, Leffmann¹¹ proposes the entire omission of all powdered vegetable matter, such as orris root and cinchona bark; also cuttle-fish bone or other gritty matter. He incorporates with the magnesium carbonate as much of some one of the organic antiseptics as can be borne. If a perfume is needed, he uses oil of wintergreen.

The prophylactic treatment of the teeth has met with more than its usual share of notice during the past year. M. Le Gendre contributes an able article on the antiseptics of the teeth, in which he holds that if parents could be induced to give the teeth of their children sufficient attention during early childhood and youth, caries would disappear. He gives full credit to micro-organisms as etiological factors in caries, and says that M. Galippe has discovered a microbe that causes alveolar, dental periostitis; which, however, has no relation to caries, as this micro-organism is not an acid producer. He presents the following antiseptic prescription:

benzoic acid, 3 grams; thymic acid, 10 centigrams; tincture of eucalyptus, 10 grams; water, 1000 grams. To be used night and morning.

Miller,¹⁷ of Berlin, in a recent article on the prophylactic treatment of the teeth, dwells upon the necessity of attending to the temporary teeth and thus insuring a better permanent denture. He cites the known influence of the temporary upon the developing permanent teeth. By prophylactic treatment, he holds that it is quite possible to insure sound teeth, in the majority of instances. Perfectly formed teeth possess the greatest power of resisting the effects of putrefaction of any of the tissues of the body. If, however, the salts of calcium be removed, the organic portion soon succumbs to the inroads of the micro-organisms. Decalcification is the result of acids formed in the mouth,—especially *lactic acid*,—which are produced principally by the fermentation of the carbohydrates. Decay does not begin upon the smooth surfaces of the teeth, but between the teeth and in the sulci and fissures, such as allow of the accumulation and fermentation of food. Decay probably is more rapid at night than during the day, for when the quantity of saliva is diminished the acids are less diluted. Tooth powders are not considered as good as soaps of a neutral or slightly alkaline reaction. He suggests the following formulæ: \mathcal{R} calcar. carb. præc., 120 grams (3iv); cort. chin. fusc., 60 grams (3ij); conchæ præp., 60 grams (3ij); pulv. myrrh., 30 grams (3j); pulv. caryophyll., 15 grams (3ss); ol. cinnam., \mathfrak{m} x–xx. M. f. pulvis. S.—Tooth powder. \mathcal{R} magnes. carbon.; rhizom. irid. florent.; talci; sap. medicat., āā 5 grams (3iss); ol. menth. piper., \mathfrak{m} x. Mucil. gum. arab., q.s. ut fiat massa. S.—Tooth soap.

Gargles are also recommended by Miller to render antiseptic the fluids of the oral cavity. They are of practical use, since it has been shown that the fungi of the mouth, with the power of forming acids, are among the direct agents that operate to produce decay. \mathcal{R} acid. thymol, 0.25 grams (gr. iv); acid. benzoic., 3 grams (3ij); fol. eucalypt., 15 grams. (3iv); alcoh. absol., 100 grams. (3iiiss); ol. gaultheriæ, \mathfrak{m} xxv; or ol. menth. pip., \mathfrak{m} xx. M. f. S.—Use as a gargle by adding a tablespoonful to a tumbler of lukewarm water after meals and on retiring.

In other instances when the saliva presents an acid reaction, as during pregnancy, and also in certain diseases, such as gout,

rheumatism, gastro-enteritis, etc., alkaline gargles should be prescribed: sodæ bicarb. $\frac{1}{100}$. These may also be used to neutralize the corrosive action of the mineral acids, when administered by the mouth and when fruits have been partaken of as a diet.

ANÆSTHETICS, LOCAL AND GENERAL.

Brom-ethyl.—Julian Scheps¹⁸ presents the claims of bromethyl as an anæsthetic in dental surgery. He says that it combines the best properties of chloroform and of nitrous oxide, with few of their disadvantages. It is easy of administration and its effects are soon over. H. C. Wood holds that it has a direct paralyzing effect upon the muscles of the heart, and consequently is equally as dangerous as chloroform. Scheps says that the danger lies in too long administration, and that the patient should always be kept in a horizontal position while the drug is being administered. This forms one of the objections to its use in dental operations, and we do not think that it will ever supplant ether or nitrous oxide, both of which are comparatively safe in the hands of competent men. Chloroform should never be administered under any circumstances by dentists, either alone or in combination with ether.

Cocaine.—Since the elaborate monograph by Witzel last year, the journals, medical and dental, have been overrun by all forms of prescriptions for the relief of every imaginable ache and pain in connection with the teeth. To the practical dentist who knows the etiology of orthodontia, many of them are amusing. That cocaine has a limited place in the armamentarium of every dentist, there can be no doubt; but that it is a general panacea for all the ills that centre in the oral cavity is hardly probable. As a local anæsthetic for the gums in the extraction of teeth it may be used with advantage in some instances; but there is always the danger of after-hæmorrhage, on account of its paralyzing action upon the vessels. Then, again, the fact of its utility in allaying pain in an inflamed pulp has not yet been clearly demonstrated. When the drug was first brought out, the editor, having charge of the administration of anæsthetics in a large clinic, and thus had an excellent opportunity to test it. It was found to do very well for superficial operations, but where there was any great amount of inflammation it failed to be absorbed and did little or no good. From observations then made the editor has been led to doubt its

efficacy in inflamed conditions of the pulp, although having had no practical experience in its use on that organ. The statements of the profession are so conflicting that one is left completely at a loss as to its real value as a local anæsthetic.

Morton Smales advocates its use in a general way, praising it very highly. He uses it in varying strengths, from 5 per cent. to 25 per cent.; but says that the stronger solutions act most happily in his hands. Of the so-called "cocaine faintness," he has seen little or nothing, except in the journals. He tried it upon himself by injecting a 20 per cent. solution into the gums over the central incisors and forcibly wedging them apart with a piece of hard wood, "driving it home" with a mallet, and experienced but little pain.

Dr. Bax,²⁰ of Amiens, experimented upon himself with hypodermic injections of cocaine, using a 4 per cent. solution. He extracted an inferior and superior molar at one sitting without any pain or subsequent bad results. Only six drops of the solution were used.

On the other hand, Tothill²¹ records his rather unfavorable experience in the use of cocaine in the following quoted cases: Case 1.—A girl, aged 12 years. One grain of the hydrochlorate in solution was injected, half on the buccal and half on the lingual surfaces of the gum, preparatory to the extraction of the first right lower molar. In six minutes the extraction was proceeded with, and was almost free from pain, but the child showed some stupor and vomited. She came round in about ten minutes, and could leave. Cases 2 and 3.—Robust young women, both requiring extraction of upper molars. The cocaine was used in manner and quantity as above. In each case there was slight pain and stupor. Case 4 was an anæmic girl in a hospital at Lewisham. Injected with the same quantity, in ten minutes she lost consciousness, and remained so for two hours and a half. Case 5 was an old man. No pain and no constitutional disturbances. Case 6.—A gentleman, aged 27, required extraction of upper central. A sudden movement of the head at the time of injection displaced the needle. Within a minute he became violent, his pupils were enormously dilated, his pulse was beating six times to each inspiration, face pale with dark-blue lines round mouth and eyes. He soon vomited, however, and became better, and was able to leave in a short time.

An editorial in the *Lancet* sums up the objections against the use of cocaine in the mouth as follow: "(1) The physical barrier to injection which the bony alveolus interposes. (2) The pain, however slight, due to the puncture of the syringe. (3) The mental suspense due to the necessity of waiting several minutes between the injection and operation. (4) The full consciousness under which the operation is performed. (5) The varying idiosyncrasy of patients with reference to the drug. (6) The inconstancy of production of complete anæsthesia. (7) The necessity of limiting the dose, so that only one part of the mouth can be safely anæsthetized for the same patient at a given time, and that only such as to allow of one, or at most two, teeth being removed. These all combine to relegate the drug to a subordinate or secondary position, leaving nitrous oxide in the possession of the field as *facile princeps* for the vast majority of such operations."

REFERENCES.

1. La France Méd. 2. Am. Public Health Assoc., 1881. 3. Biol. Lab. Johns Hopkins Univ., 1882. 4. Deut. Med. Woch., 1882. 5. Independent Pract. 6. Flügge, Micro-organismen. 7. Lancet. 8. Am. System of Dentistry. 9. Jour. Am. Med. Assoc. 10. Independent Pract. 11. Cosmos. 12. Deut. Med. Woch. 13. Cosmos. 14. Truman, in Cosmos, 1883. 15. Cosmos. 16. L'Union Méd. 17. Cent. f. d. ges. Ther. 18. Cent. f. Chir. 19. Lancet. 20. Gaz. Méd. de la Picardie. 21. London Med. Rec.

[Undated references apply to journals published in 1887, and original articles can be found by consulting the indexes of the respective publications.]

PROSTHETIC DENTISTRY AND ORTHODONTIA.

By S. H. GUILFORD, D.D.S., PH.D.,

PHILADELPHIA.

PROSTHETIC DENTISTRY.

THE ALUMINIUM BASE.

THE attention of the dental profession was first directed to the use and possible importance of aluminium, as a base for artificial dentures, some twenty years ago.

This metal was well known to possess certain qualities most desirable in a base, such as lightness, non-oxidability, conductivity, tastelessness and inexpensiveness. Associated with these advantages, however, there were certain disadvantages, or rather obstacles, in the way of its employment. To cast it seemed impossible, owing to its low specific gravity, while at the same time its contraction in returning from a fluid to a solid state was so great as to destroy its usefulness.

In 1867, Dr. James B. Bean,¹ of Baltimore, began experimenting with a view to overcoming these obstacles, and so far succeeded as to be able to produce a plate that not only fitted well, but was also remarkable as a piece of perfect casting. The casting was accomplished by using compressed air to force the metal into the mould and retain it there, while the shrinkage was compensated for by dividing the model into sections and slightly enlarging it. His sudden death prevented the extension of his experiments and no one else took them up. Soon afterward, aluminium was placed upon the market in the form of plate, and its use was resumed by many practitioners with a view to avoiding the use of rubber. The plate after being annealed at a dull red heat was swaged into form between a zinc die and lead counter in the same manner as gold or silver. The portion covering the alveolar ridge was perforated with holes countersunk on the palatal side. Teeth were then mounted upon it in the usual manner and attached by means of rubber or fusible metal. All of the plates thus constructed

proved to be failures eventually; for after being worn a few years the plate became honey-combed with holes, owing to local galvanic action between the impurities of the metal and the metal itself.

Up to that time the known methods of refining the metal did not succeed in freeing it from all impurities, and hence the failures.

Recently, however, Dr. C. C. Carroll, of Meadville, Pa., has succeeded in refining the metal to such an extent as to render it practically pure, and has invented appliances by which he is able to produce a cast plate perfect in fit and even and tough in texture.

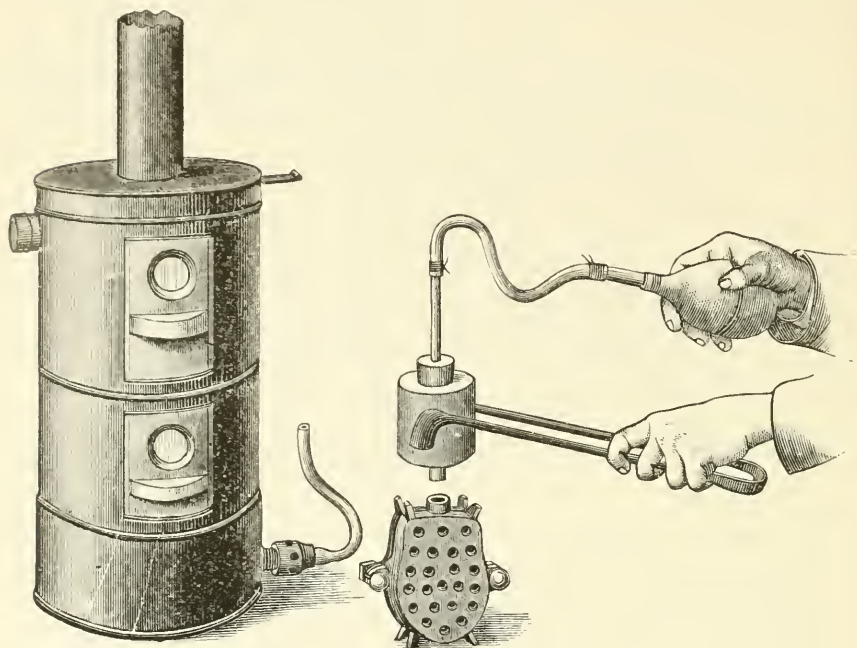


FIG 1.

After obtaining the pure aluminium, he alloys it with a small amount of other metal, which prevents or greatly controls the contraction in cooling.

Fig. 1 represents his apparatus for producing the cast plates.

The denture is constructed in the following manner, viz.:—The plaster model is obtained from an impression in the usual manner, after which the wax base-plate is modeled to it and a bite obtained. Gum sections or plain rubber teeth (the latter preferred) are arranged as for rubber work, after which the model with base-

plate and teeth are invested in one half of the perforated flask. When hardened and trimmed, the second half is poured. After opening and removing the wax and forming the pouring and waste gains the flask is placed in the furnace and all moisture driven off. When the flask is dry and heated, the plumbago crucible containing the metal is also placed in the furnace and brought to the point of fusion. The flask and crucible are then removed from the furnace, the crucible stopper with rubber tube and bulb attachment is fitted to the crucible, and the latter placed in position on the

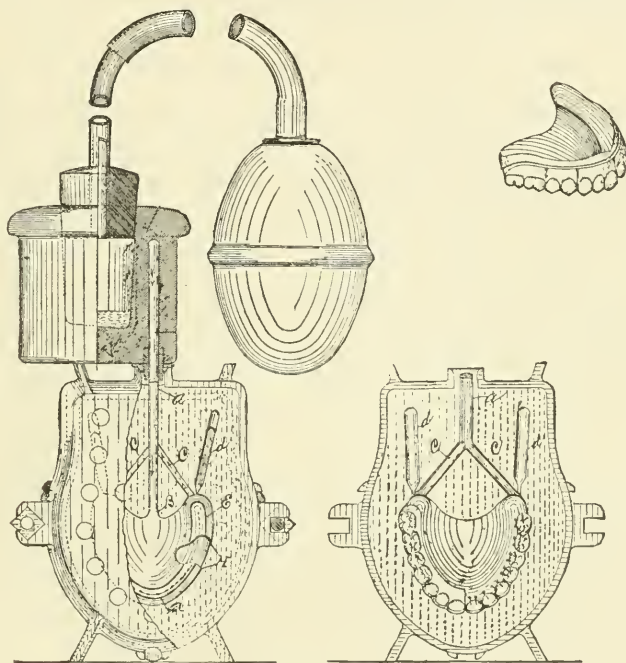


FIG. 2.

flask. Pressure upon the bulb forces the molten metal out of the crucible and into the flask, where it is kept under pressure for about twenty seconds to insure solidity and freedom from air bubbles. After the flask is cool, the plate is removed and finished with files, scrapers and the usual polishing materials. The investing material is composed of plaster mixed with an equal bulk of sand or marble dust. Fig. 2 clearly illustrates the details of the process.

In some cases where it is desired to attach the teeth by means of rubber or celluloid, a blank plate of aluminium is cast with an

undercut flange near the edge of the plate on the buccal surface and a similar one on the lingual surface about half an inch below the centre of the alveolar ridge.

For mending a plate or replacing a tooth, a special alloy is furnished capable of being fused in position by means of a soldering iron. Plates constructed after this method are light in weight and beautiful in appearance, and may if desired be electroplated with gold. Whether all that is expected of them in the way of durability will be realized, remains to be seen; but the promise of it is very flattering at the present time.

IMPERFECT PLASTER IMPRESSIONS AND MODELS.

The causes responsible for the ill-fitting of artificial dentures are doubtless many, and the investigation of them must ever be of interest to the dental practitioner. Every one who undertakes to replace lost dental organs with artificial substitutes, at times meets with cases that present unusual difficulties. Oftentimes these difficulties are recognized in advance and by skillful management are overcome; while at other times they are not recognized or suspected until the denture is completed and the lack of fit or adaptation is made apparent. Even when recognized in advance, they are frequently most difficult to overcome. Different writers have from time to time given their views as to the various causes that are responsible for lack of success in the construction of properly fitting dentures, and the subject has recently excited new interest since the publication of the result of experiments by Prof. W. B. MacLeod, of Edinburgh, upon the expansion and warpage of plaster of Paris in setting.

Dr. W. H. Trueman, of Philadelphia, presents the following as his views upon the subject, viz.: "I presume there are few operators of much experience who have not at times been non-plussed at finding a plate, accurately fitting a cast made from an apparently perfect plaster impression, proving when inserted in the mouth a hopeless misfit.

"The expansion or warping of plaster used in the impression or the model has often been assigned as the cause, careful experiments having proved that some qualities of plaster expand or, otherwise change their form either at the time of setting or shortly afterward to an appreciable extent. All observers agree, however,

that this change in plaster prepared especially for dental use and properly manipulated is extremely slight,—so slight indeed that only in rare cases would it cause a misfitting plate. If we admit that the expansion or warping of the plaster is an important factor in causing these annoying failures, it is difficult to explain why they occur so rarely when due care is observed in taking the impression and making from it the plaster model, when the cause, modified by the shape and mass of the impression, is evidently a constant one; or, why a repetition of the process by which the faulty model was obtained should produce another entirely satisfactory. Again, all admit that the expansion and warping of plaster is quite limited in extent, being in extreme cases far less than will be compensated for by the yielding of the tissues upon which the plate rests; while the discrepancies of a misfitting plate are at times quite startling, and point unmistakably to an unobserved error in manipulation as the real cause. Occasionally we may find the plate or the finished denture to apparently fit perfectly, and yet prove useless, the patient being unable to retain it in position. There may be other causes than the adaptation of the denture to the gum tissues to account for this; but it is still difficult to explain why in such cases remaking the denture upon a model from another impression should remedy the difficulty, each denture apparently fitting equally well. We cannot in these cases invariably charge the fault to an imperfect impression, or to a defective model. Not unfrequently it is due to faulty workmanship. An imperfect metallic die may cause an almost unobservable injury to the plaster model, quite sufficient to account for a serious misfit. Unskillful swaging, errors in annealing the plate, or rigidity in the plate or a part thereof caused by an accidental alloy; or one of the many accidents that may happen to even a careful workman are among the causes that may at times occasion these almost inexplicable failures. Unequal pressure upon the plaster model during the process of packing vulcanizable rubber, especially if dry heat is not used; or in moulding celluloid and in casting plates; unequal contraction of the mould or of the metal; the presence of confined atmospheric air or of gases in the mould, are each liable to cause change in the form of the plate, oftentimes with little visible sign of their effects.

“While we believe that a well-fitting plate is the result of

and largely dependent upon good judgment and good workmanship, the converse of this cannot be so strongly insisted upon; neither is the practical usefulness of a denture in all cases proportionate to the accuracy with which it fits the mouth. The shape of the maxilla, the character and peculiarities of the tissues upon which the plate rests, and the patient's "knack" or dexterity in using and humoring it are all factors that may, on the one hand, impair the usefulness of a well-fitting dental plate, or, on the other hand, render a misfitting one comparatively useful and comfortable.

"The impression and the model made from it form in all cases the foundation upon which the denture is built. It is all important, therefore, that they should be accurate, and to this end equally important that the operator should be thoroughly conversant with the many mishaps by which their accuracy may be impaired during the process of obtaining them,—especially in regard to those which from their infrequency are more liable to be overlooked, and the effect assigned to other causes.

"In proceeding to describe the process of obtaining an impression of the mouth in plaster for a full upper denture, I desire to direct attention to a few points not usually noted in the text books, but which experience has convinced me are responsible for some otherwise unexplained failures.

"The cases where any material, other than plaster, should be used in taking an impression for a full denture, upper or lower, are exceedingly few, and their consideration is foreign to our purpose. After examining the mouth, noting its peculiarities, and selecting a suitable cup, we proceed, if for the upper jaw, to adjust a rim of yellow wax to close up the opening, if it is at all large, that usually exists between the back edge of the cup and the roof of the mouth, not so much for the purpose of preventing the plaster running too far back as to prevent its "creeping," or oozing from position (as it is apt to do if not restrained) after the cup is pressed into place. This wax rim has also another important office; by its pressure upon the tissues it limits the motion of the palate caused by the patient's efforts to swallow, "gagging," etc., or the involuntary spasmodic efforts resulting from the presence of the cup and its contents. Without this precaution, and at times in spite of it, these spasmodic movements will displace the plaster to a marked degree, more especially at the sides where the

tissues are more mobile. While the wax is still plastic, place the cup in the mouth and press it into position and mould the wax until it makes a firm and even pressure upon the roof of the mouth a little beyond the posterior line of the intended plate. In ordinary cases quick-setting plaster is not the best for impressions; it takes a minute or two to manipulate the cup into place and to adjust the surplus plaster under the lip. If the plaster is known to be quick-setting, the cup is hurried into the mouth, and instead of being firmly and steadily carried to place is apt to be rocked or tilted just as the plaster is setting. The resulting impression may seem to be sharp and perfect, but it will produce a model from which a well-fitting plate cannot be made.

“The consistency of the plaster mixed for taking an impression is a matter of judgment. No rule can be given other than to say that it should be sufficiently stiff to retain its form upon the cup in all cases. It has been contended that the impression material should be capable of exerting sufficient pressure to compress the more yielding portions of the tissues. To a limited extent this may be permitted. I think it better, however, to adjust the pressure of the plate upon the softer portions of the mouth by carving the plaster model. I always prefer that the impression shall give an accurate model of the surface upon which the plate is to rest. If we make the impression to press unduly upon the more yielding portions, we cannot tell to how great an extent their shape may be changed and distorted. This is especially true in cases where the alveolar border is abnormally mobile. In such cases I prefer to use the plaster as soft as it can be manipulated, and endeavor to so insert the cup that the plaster will flow over the more yielding portions without pressing them out of position. Occasionally, especially when the mouth is irritable, the patient restless, or the flow of saliva excessive, it is best to use the plaster not only stiff, but also to insert it quickly, just as it is on the point of setting. Such cases are frequently troublesome and unsatisfactory, and we may be compelled to manage with the best impression we can get and depend upon correcting unavoidable errors at a later stage.

“The arrangement of the plaster upon the cup will depend largely upon the form of the dental arch. It is desirable that when the cup and its contents are placed in the mouth, the plaster

at its back edge shall be first brought into contact with the roof of the mouth and pressed nearly into position. The front of the cup is then slowly and deliberately raised, care being taken that the back part is not at the same time depressed. While this is being done, with the fingers of the free hand draw outward the cheek and lips, in order to prevent any loose tissues from folding in upon the outer border of the ridge. At the last moment, when the cup is nearly in place, as nearly central as may be, place one finger (usually the first finger of the right hand) under the cup and press it up vertically, the finger being so curved that its end only shall touch, the cup being sustained wholly by pressure at this one point. If possible, the position of this finger should not be changed, nor pressure relaxed until the plaster has set. In the mean time, however, the fingers of the free hand should gently take hold of the upper lip, first on one side and then on the other, and, drawing it outward and over the plaster that has pressed out above the front edge of the cup, press it in and up so as to force the plaster as far up under the lip as possible, completing this manipulation by a gentle pressure along the full extent of the lip.

“The plaster when first mixed, and while quite soft, readily flows over any surface on which it is placed or against which it is pressed. As it stiffens in the process of setting, it materially changes its character. It soon acquires sufficient consistency to retain, if undisturbed, any form that has been given to it, but at the same time is sufficiently plastic to be accurately remoulded upon a new and a different surface. If, during the process we have just described, a side pressure should be brought to bear upon the cup and its contents after this condition has been reached, the plaster will, responsive to this pressure, readily leave one side of the palatal arch, retaining, although not in contact with it, an impression of its surface, while the other side as readily yields to permit it. At an earlier stage, the pressure upon the cup would cause the plaster to flow and fill up the vacancy caused by a movement of this kind. If an attempt is made to rigidly hold the cup, the yielding of the patient's head, or unsteadiness of the operator will make an error of this kind almost inevitable. An impression may thus be rendered defective to a surprising degree, and yet it may cling firmly to its position when the attempt to remove it is made, and to all appearances seem sharp and

accurate. It is to this end that, in taking an upper impression, I recommend that a firm, continued vertical pressure should be maintained centrally under the cup with the end of one finger only. This forms a pivotal point, permitting a reasonable amount of motion upon the part of the patient or the operator, with but little risk of material displacement.

“To the same end, in taking plaster impressions of the lower jaw, after the cup and contents have been manipulated into place, I firmly hold it in position by so curving the first finger of each hand that the ends only shall rest upon the upper surface of the cup on each side at about the position normally occupied by the bicuspid teeth, the thumbs resting upon the chin immediately beneath, being careful that no greater pressure shall be exerted upon one side than upon the other.

“In taking full upper and lower impressions of the mouth in plaster, the important point I especially desire to impress is this, viz., that the cup and its contained plaster shall be well in place and immovably held there before the plaster has acquired such consistency as to cease flowing.

“An accurate impression, however, does not necessarily yield an accurate model.

“I consider it immaterial whether the plaster to form the model or cast is poured into the impression immediately, or after the lapse of hours or days; an accurate or inaccurate model may be the result in either case. The first step is to coat the impression with some material that will prevent the plaster of the model from uniting with that of the impression.

“Probably the best plan is to allow the impression to become dry, then apply a thin, uniform coating of shellac varnish, following this with two similar coats of sandarac varnish, each coat being allowed to dry before the next is applied. The varnish should be quite thin, so as not to fill up the fine lines of the impression. When varnish is used the impression should be placed in water for a few minutes immediately before the plaster is poured into it. It is better in all cases to thus wet the impression before making the model. I prefer to form around the impression a ring of wax of sufficient height to give the model the required thickness, placing upon this, after the plaster has been poured in, a plate of glass to give a smooth, even surface to the bottom of the model. The plaster for

the model should be mixed thoroughly and quickly, and be of somewhat greater consistency than that used for impressions, as it is desirable that it should have a hard surface and be able to withstand the subsequent manipulations. The impression should not be inverted after it is filled until it has acquired sufficient consistency to prevent change of form; neglect of this will, at times, allow the plaster to gravitate or settle from the impression, especially along its posterior edge. This settling may be even or uneven; it may cause a very perceptible crack or opening between those portions which have settled and those which have not; or it may show no signs and the injury be discovered only when the plate made upon it is tried in the mouth. The error is then unjustly assigned to the impression.

"I have seen cases where a space of one-sixteenth of an inch existed between the impression and the model, and yet after the impression was removed the model seemed perfect in every respect. If looked for, this defect is of course readily seen when removing the impression from the model; but in many cases it may be overlooked and pass unnoticed. If the impression be wet, the plaster of proper consistency, and manipulated with ordinary care, the resulting model will usually be correct and satisfactory."

Upon the subject of the "Principles involved in retaining an artificial denture," Prof. L. P. Haskell, of Chicago, contributes the following, viz.:—

"There are two principles involved in solving this problem, viz., the fitting of the plate and the articulation of the teeth,—the latter being equally important with the former and the cause of more failures.

"Instead of fitting the plate to the entire surface, I find it better to prevent its coming in close contact with the hard palatal bone, for the reason that everywhere else the membrane and even the process to a greater or less extent, yields to pressure, leaving the plate to bear and rock, and thus interfere with its usefulness. By raising the model over this hard portion with a thin film of wax, all trouble will usually be prevented. Occasionally a mouth is met with where the entire surface is yielding and a crevice exists in the palate. In such cases, the plate must be fitted closely to the entire surface and into the crevice, at its terminal points at least.

"Aside from this I make very little if any change in the model. In some mouths where the tissues are very soft at the posterior margin of the plate, it is well to scrape the surface of the model slightly, leaving in the centre a space of $\frac{1}{4}$ inch in width untouched, and scraping from this to the tuberosities and extending forward $\frac{1}{4}$ inch or more. I never have found it necessary to make a ridge across the back of the plate to press into the membrane.

"The plate should be made to extend as high as possible, especially over the cuspid region, for it is necessary here not only to properly restore the contour of the lip, but to cause the plate to set more firmly and make the adhesion better. Always carry it over the tuberosities, no matter how prominent they are. The margin of the plate when worn so high should not be fitted close to the membrane, but turned out slightly so as not to impinge and irritate.

"The point to be particularly observed in fitting the plate is in the centre at the rear. After wetting the palatal surface of the plate, press it firmly into place and pump it, to see if air bubbles escape, and, if so, burnish it closer to the model. At the same time be sure that it does not press so hard as to irritate, for if it should, the plate will be displaced in a short time. I claim that if the plate fits the jaw and comes in close contact with the membrane, there will be all the adhesion that is necessary. It is well known that a plate will adhere better to a soft membrane than a hard one; and I much prefer a comparatively shallow arch to a deep one.

"In cases, so many of which have occurred in late years, where the process has been absorbed and a thick ridge of the membrane remains, yielding constantly to pressure, I consider it best to allow this to remain in its normal position, or where the plate which caused it has forced it; for it cannot by any possibility be gotten into a position by an impression or otherwise where it will not yield to pressure upon its margin, and if it could its elasticity would constantly tend to lift the plate from its proper bearing. Better let it alone and see that the teeth are so articulated as to throw the pressure back of the cuspids, and toward the centre. I have put into many such mouths continuous gum work, with satisfactory results to the patient.

“In regard to the relative merit of materials in the fitting of plates, I have had better success with swaged plates than with rubber; and yet it is generally supposed that in difficult cases a rubber plate can be fitted more successfully than a metal one. I have demonstrated in many difficult cases that this is a fallacy. With the plate fitted, my only test of adhesion is pressing it firmly into place, and then attempting its removal. In most cases there is a strong adhesion; but I do not ask the patient's opinion as to the fit or suction, as I am the better judge. In some difficult cases, the adhesion does not seem strong; perhaps there is none at all; but I give myself no concern, feeling confident that when the completed work is adjusted in the mouth and the jaws are closed a few moments or possibly hours will make all right, and I am not disappointed.

“Now comes a point equally as important as a good fit, and more important than a strong suction, viz., faultless articulation. This means that whenever the jaws are closed, as they are constantly being in the act of swallowing, the plate is in no measure displaced. There are thousands of dentures, otherwise all that could be desired, that prove failures simply from faulty articulation.

“How is this to be guarded against? The six anterior teeth must not come in contact with the lower teeth, except in rare cases where the lower jaw is very prominent and the upper teeth must be necessarily arranged to occlude inside the lower ones: in such cases the pressure is favorable. The pressure must always be uniform upon the sides, not meeting on one side before the other.

“If there are lower wisdom teeth, or second molars, that incline forward so that their masticating surfaces are seen from the front, they should never be allowed to meet the faces of the upper teeth, as they inevitably crowd the artificial teeth forward and cause displacement. If the upper teeth cannot be set upon the top of these inclined teeth, or placed back of them and below their surfaces so as to make a catch and press backward, better let them alone. Then again, the pressure should be upon the bicuspid and first molar; for if upon the second molar, when adjusted in the mouth, they will in a short time press too hard.

“It is not uncommon in the insertion of a full upper set, to have in the lower jaw the six anterior teeth, one or two bicuspid upon one side, and no teeth upon the other side. In such cases,

the patient may generally expect trouble, because the pressure is inevitably upon the front teeth, or at one corner on the cuspid and bicuspid, and displacement ensues.

"The insertion of a partial lower set does not remedy the trouble, for it soon yields to pressure and the artificial teeth become too short. The only remedy in such cases is the extraction of these one or two bicuspids, they being practically useless, and the insertion of a partial lower set so that the entire pressure upon both sides is upon artificial teeth.

"Again, care must be exercised not to throw the pressure outside of the ridge, but in a direction that will not tend to tilt the plate. To accomplish this, it is sometimes necessary to contract the space, as it will not be possible to set the teeth as far out at the sides as the natural ones were.

"As to the matter of the extraction of teeth, when the patient has reached the condition that a partial or full denture must be worn, the question simply resolves itself into this, viz.: 'What must be done to make the artificial denture the most comfortable and useful?' If the extraction of certain teeth is necessary to insure the usefulness of a plate, do not hesitate to do it."

PORCELAIN AS A SUBSTITUTE FOR GOLD IN RESTORING CARIOUS AND BROKEN TEETH.

With all the advantages of gold as a filling material, its lack of harmony with the color of the teeth, and its conspicuousness in exposed positions have constituted valid objections to its use in certain cases.

The zinc cements which it was hoped would satisfactorily take the place of gold in filling labial cavities in the anterior portion of the mouth have proven unsatisfactory from their lack of durability, and the desire has long been felt for a filling material that would be both durable and nearly approach the color of the natural teeth.

In cavities that were large in extent and conspicuous in position, it has been the custom of some operators to grind from a porcelain plate-tooth a section of about the size and shape of the cavity to be filled and then fasten this in position with one of the zinc cements. After the cement had hardened the exposed portion of it was removed and replaced with gold foil. Although satisfactory in its result, the operation was a tedious and difficult one,

and the profession have been eagerly looking for the devising of some plan by which the same results might be obtained in a simpler and easier manner.

Dr. Wilhelm Herbst, of Bremen, Germany, conceived the plan of taking the impression of the prepared cavity in modeling compound, and from this making a model of equal parts of plaster and marble dust. Into the cavity of the model he placed finely ground glass or jeweler's enamel of light colors, which he fused into a mass in a thin platinum muffle under the flame of the blow-pipe. This stopper of glass was then inserted into the cavity in the natural tooth with zinc phosphate. This method, while simple and in some respects an improvement on the method formerly employed, did not meet the demands of the profession in the matter of harmony of color.

Within the past year or two the efforts of some of our most successful porcelain workers have been directed toward the production of a porcelain filling that should be easy of construction and perfectly in harmony with the color of the natural teeth.

Dr. Ambler Tees, of Philadelphia, contributes his method of making porcelain substitutes for filling and replacements, as follows, viz.: "Prepare the cavity and make the edges smooth with corundum points. Take two impressions of the cavity with modeling composition. Into these run a mixture of two parts of very finely powdered silex and one part of plaster; when hard, varnish the cavity and the model with shellac varnish. Pack continuous gum body into the cavity and carve to the original contour. Place the model upon a slide and bake the body to fusion. When cool, remove the filling, place it in the cavity of the remaining model, restore the contour with more body and fuse again. In the majority of cavities, no pins or holes will be required to secure firm attachment, the adhesiveness of the oxyphosphate being sufficient. If necessary to have additional security, place a little piece of base-plate wax in the bottom of the cavity in the plaster and silex model. Press the heads of two platina pins in the wax, leaving the remaining portion of the pins to be baked in the body of the filling. A hollow crown can be made to cover a live or devitalized tooth by grinding off the enamel, taking two impressions with modeling composition, and forming two models of plaster and silex. Apply a thin coating of continuous gum body

around the model and carve in imitation of the crown needed. Fuse and place on the remaining model, and carve and fuse again. If desirable, an enamel can be made by mixing and grinding together the enamel of the proper shade (procurable of the tooth maker) and flint glass in equal quantities; or a very thin facing can be made by grinding a continuous gum or plate tooth, and placing it upon the front surface, moistening the body and pressing it into position, then fusing as before.

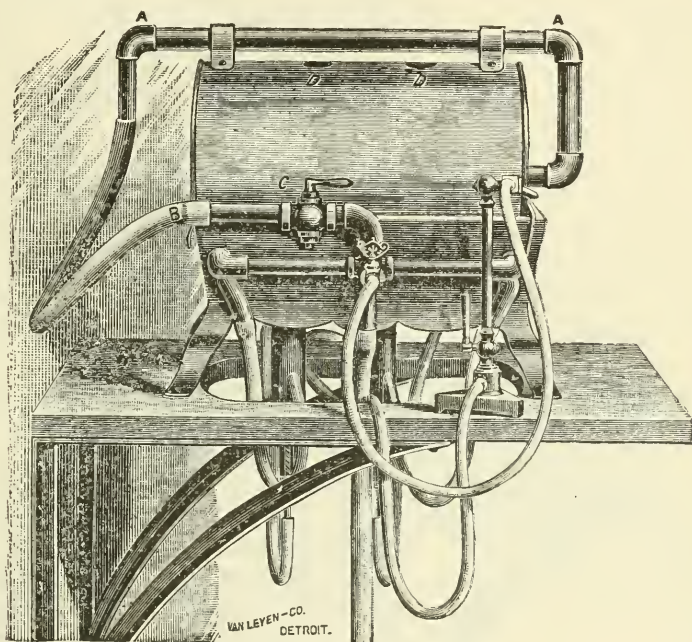


FIG. 3.

“Dr. C. H. Land, of Detroit, Michigan, has recently invented and introduced a novel and ingeniously contrived gas furnace for continuous gum work, assaying, and other purposes, with an improvement by which he claims he can rid the muffle of accumulated gas, which has been one of the objections to gas furnaces. This improvement consists in forcing air by means of a pipe into the muffle, where it combines with the carbon monoxide and, by eliminating nitrogen, protects the teeth and body.

“By perforating the muffle with three $\frac{1}{4}$ -inch holes in the upper portion at the rear end, vent is given to foul gases, and when the current of air is passed in at the front, it will pass out at the rear

through these holes. Gasoline can also be used in this furnace in localities where gas is not available.

“Dr. Land says that with the ordinary foot bellows as manufactured by the Buffalo Dental Manufacturing Company, he can bake continuous gum body in fifteen minutes by pumping. In his own laboratory, where steam power is available, he can secure a blast of air by simply turning a stop cock.

“Fig. 3 represents the furnace closed, ready for the blast.

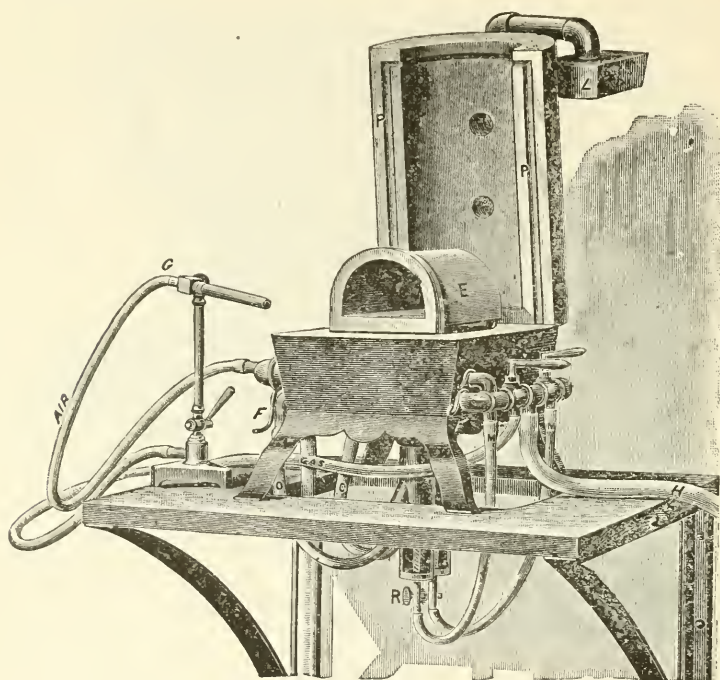


FIG. 4.

“Fig. 4 represents the furnace with the door swung open, exposing the muffle.

“He also manufactures a crown furnace, one-fourth the size of that shown in Figs. 3 and 4, especially adapted for making porcelain fillings, crown and sectional block work. It is much easier to operate, and does the work more rapidly. In this furnace Dr. Land makes crowns and partial crowns, using platina plate as a base upon which to build the crown.

“Fig. 5 represents the different stages in the construction of one form of porcelain crown. *a* illustrates the neck and roots

of an inferior molar, with two pins anchored. *b* exhibits a platina disk, with tubes adjusted to correspond to the position of the pins in *a*. Porcelain body is built about the tubes, and carved to imitate a crown, and when fused will form a porcelain crown, as shown in *c*. Cement is applied, and the pins forced into the tubes. *d* shows the completed crown in cross section.

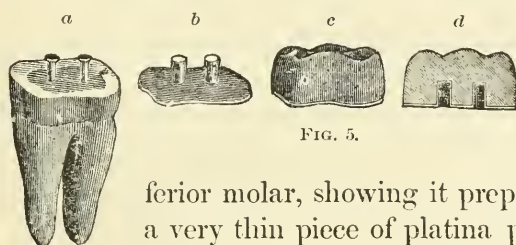


FIG. 5.

“Fig. 6 illustrates in detail the method of constructing a porcelain filling. *e* represents the buccal cavity in an inferior molar, showing it prepared for filling. *f* exhibits a very thin piece of platina plate, which has been burnished into the cavity, and nicely trimmed. A hole is drilled through the centre of this, and a platina pyramid fitted over it and soldered to the base, as shown in the cavity side of the completed section *h*. *g* illustrates the completed section, showing its buccal porcelain surface. *i* shows the section cemented in the cavity.

“Fig. 7 represents the method of constructing a porcelain filling of different form. *j* illustrates a tooth in which there is a deep cavity. In such a case, Dr. Land does not attach pins or

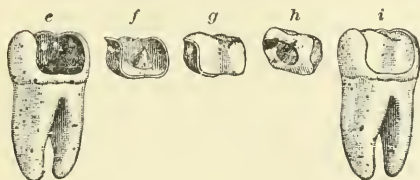


FIG. 6.

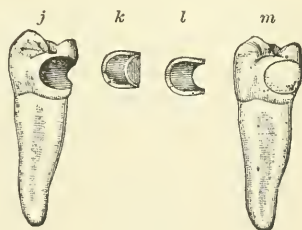


FIG. 7.

a pyramid, but relies solely upon the cement to retain the section in position. *k* and *l* show two views of the thin platina base, which is burnished into the cavity. Upon this he fuses porcelain, imitating the contour of the lost portion of the tooth. He then removes the platina base from the porcelain filling. *m* shows the tooth with the section cemented in the cavity.

“Dr. Land also makes hollow crowns of platina plate, to cover badly decayed teeth. He reduces the surfaces by means of small corundum wheels, and fits the platina to the crown thus prepared.

“Upon the labial surface he fuses the porcelain facing, ground thin, using continuous gum body for this purpose, as well as to enamel the other portions of the platina crown.

“Dr. John M. Crowell, of New York, has lately constructed a small furnace for the purpose of enameling twenty carat gold plate, with a body and gum enamel, fusing at a low temperature. It is 6 inches high, 5 inches deep and $7\frac{1}{2}$ inches wide. It is heated either with a gas blow-pipe or with an automatic gasoline lamp. It bakes the body of gum enamel in ten minutes from the time the lamp is lighted. He uses continuous gum teeth, and solders them with 20 carat solder to the gold plate. He also uses his body and gum enamel in constructing continuous gum work, claiming that they shrink less and are stronger than the ordinary continuous gum body and enamel.”

PORCELAIN TIPS FOR BROKEN FRONT TEETH HAVING LIVING PULPS.

Where a tooth in the anterior portion of the mouth has been broken without injury to the pulp, it has been found exceedingly difficult to supply a suitable substitute for the broken portion without devitalizing the pulp in order to use the canal for anchorage. Gold and porcelain are the only two substances that have been considered suitable for such restoration. The former is always objectionable on account of its color and conductivity, while the latter has been found to be very difficult to attach in a simple and durable manner.

Prof. J. Bond Littig, of New York, seems to have overcome the difficulties attending the use of porcelain, and thus describes his method: “There are two ways in which porcelain tips may be readily made and adjusted, both of which I will give in detail. First, smooth off the end of the broken tooth, then drill three small holes, one at the inner edge of the enamel at the palatine surface, and the other two at the distal and mesial portions of the inner edge, using for this purpose the smallest engine burr, making the holes about one-eighth of an inch in depth and enlarging them until the pins taken from an Ash tooth will fit easily. Next, burnish a thin piece of platinum, No. 32 gauge, to the end of the tooth, letting it run slightly over the palatine surface, but only to the inner edge of the enamel on the labial surface; then with a broken excavator punch through the platinum cap into the holes

made in the tooth, into which press pieces of platinum wire (No. 20 gauge) or pins taken from broken teeth, until they touch the bottom. Now cement the pins and cap together with adhesive wax, chill and remove, and coat the pins and under side of cap with whiting and water. Invest this in plaster and sand, and flow a thin coating of gold over cap and pins, being careful not to get any on the inside of the cap.

"This cap is now replaced on the tooth and an impression taken in the usual manner. Remove the cap, place it in the proper position in the impression, and pour a model. Now select a thin English tooth of the proper shade and grind it to fit the cap and tooth, taking care not to grind too close to the pins. It is usually necessary to grind from both ends of the tooth to make the tip the required size. The tip is then backed with thin platinum, invested and soldered. The cap is now

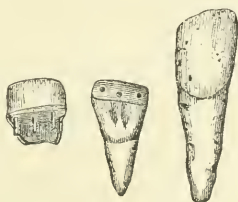


FIG. 8.

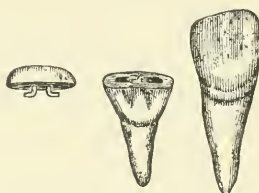


FIG. 9.

removed from the plaster tooth by heating both cap and plaster with blow-pipe, and plunging the whole into water. Now place it on the tooth in the mouth, fit the porcelain tip nicely to the cap and tooth and wax it in position. The cap and porcelain are then carefully removed, invested and united with solder. After polishing, the pins are roughened and the tip set with zinc-phosphate mixed thin. The first piece set by me was done in Dec., 1879, and has remained in good condition up to the present time.

"Fig. 8 shows the porcelain tip, backed, with the pins in place, also the prepared crown and tooth completed.

"The other method is used where the piece broken off is so narrow that the porcelain tooth cannot be ground to fit in the ordinary way without cutting out the pins.

"First cut a groove in the end of the broken tooth, making slight undercuts. The pins of a suitable porcelain tooth are bent outward and the ends flattened. The porcelain is then ground

away from both ends until it is made as narrow as the natural tooth is thick, or nearly so.

"The piece is fitted to the end of the tooth by placing the pins in the groove. If the joint is not good, grind away from either tooth or porcelain until it is perfect. Then set the piece with zinc-phosphate, and after it has become hard grind the tip to shape in the mouth and polish with moose-hide disk and pumice-stone.

"Fig. 9 illustrates the second method. The ground porcelain tip, prepared crown and restored tooth being shown separately."

CROWN AND BRIDGE WORK.

Improvements in this department of prosthetic work are being devised and brought forth constantly, many of them possessing much merit.

Dr. A. G. Bennett, of Philadelphia, furnishes a new method of mounting a Logan crown with a ferrule. He says:—

"The strong points of the ferrule-crown as compared with other crowns, especially when applied to bridging, are as obvious as the advantages of the brass rifle-shell over the old paper casing. But the superiority of the all-porcelain crown over the plate-tooth crown, when the former stands next to or between vital and translucent teeth, must have been observed by all practitioners. It is often a decided gain when the strong points of these two kinds of crowns can be united.

"The writer has been for some time combining the ferrule and the porcelain crown by a method which he has found very satisfactory. It may be applied to all roots that can be banded, but is especially adapted to cases of relatively long crowns. The root must be short and the ferrule should be quite narrow, so as to obtain all possible space for the porcelain.

"The ferrule is made in the usual way, and cemented in position, with a hole or slot in the base-plate to admit the pin of the Logan crown, which is ground until it fits against the cap all around without ledges or projections. The crown is then set with gutta-percha, which when quite soft is worked quickly around the finely barbed and heated pin. The exact amount of gutta-percha is obtained by several trials, after which the canal is thoroughly dried by absorbents and hot air, and the crown with the gutta-percha slightly softened is at once placed in position. If proper care

has been taken, there will be no excess to trim away about the joint.

"The advantages of this method are: (1) the root has the strength and protection of the ferrule and cannot split or decay; (2) the crown has a natural color and vital appearance; (3) the joint is between the porcelain and the gold, with a thin, moisture-tight packing, which cannot be dissolved out; (4) the canal can be opened in a few moments without cutting the crown and drilling out the pin.

"I have modified this method to suit frail central roots by fitting a gold tube in the canal and soldering this to the ferrule. After cementing this metallic armor in place and removing the surplus cement from the tube while soft, I carefully grind up and attach a Logan crown as already described. A gold tube used in this way has two decided advantages: (1) it securely holds the ferrule on the end of frail roots; (2) it reduces the quantity of gutta-percha, which might otherwise endanger the root, besides absorbing the fluids and gases of putrefaction.

"Bands in such cases can be very narrow, just wide enough to catch over the end of the root without impinging on the pericementum."

He also contributes the following description of a recent device of his, entitled

"THE CAP AND GROOVE ANCHORAGE FOR ATTACHING ARTIFICIAL TEETH
AND DENTAL BRIDGES."

"This attachment or anchorage is designed to inclose the palatal or buccal half of any of the teeth, but is especially adapted to the inner half of the bicuspid and molars. Its two essential features are these, viz.: (1) it covers the palatal or lingual half of the tooth vertically, extending entirely to or under the gum; (2) it fills grooves on the proximal surfaces of the tooth, which grooves may be carried through and unite in the fissure between the cusps of the molars and bicuspids, or be extended across the palatal surface of the cuspid, thus forming one continuous groove, which may extend almost or entirely to the gum or beneath its free margin.

"This device is decidedly practical because of the frequency of proximal cavities. The special points I claim in its favor are these,

viz.: (1) the tooth is usually easily prepared, little cutting or grinding being required; (2) the device is strong, besides being placed on the side of the tooth capable of bearing the greatest strain; (3) it is small, occupying less space than any other anchorage of equal holding power; (4) it is always out of sight, being on this account superior to the cap-crown; (5) it incidentally fills the proximal cavities, the gutta-percha by which it is fastened acting as a cavity lining and non-conductor.

"The proximal grooving and the palatal trimming must be on a line with the long axis of the tooth, so that the attachment may fit closely, and yet be capable of being drawn in an impression. When two or more teeth intended as supports for a bridge are prepared for this anchorage, it is, of course, all the more imperative that they be so trimmed as not only to secure a close fit of the anchorage, but so that they are parallel to each other. Where so much cutting as may be required is not practical, the anchorage must be fitted rather loosely.

"The cap and groove anchorage is made in the following manner, viz.: After making the proximal grooves with a square-end fissure drill and cutting through between the cusps with a thin-edged corundum wheel, shortening and reshaping the inner half of the tooth so that its sides will be parallel, take a piece of pure gold or platinum (No. 30 or 32 gauge), work it closely about the inner half of the tooth, extending it over the grooves, into which it is pressed with a pair of round-nosed pliers made for the purpose; notch the edge of the metal about the cusp and burnish it down; over this place a circular piece of gold, the edge of which is pressed into the groove between the cusps; fit a staple of platinum and iridium wire into the entire groove, take off the three pieces, assemble and unite them with wax cement, when they should be returned to position on the tooth, and after being nicely adjusted they should be removed, invested and soldered. The cap should not be smoothly finished until the case is completed, for the reason that some roughness or slight projections help to retain it in the impression. Bridges made with this anchorage can be set with gutta-percha, which permits their ready removal for repair or any other purpose without damage to the denture.

"The device has been used by the writer for about a year with very satisfactory results. He has been using it for some time with

the Bing bridge-teeth, though of course it can be used with any other kind suitable for bridge-work.

"The Bing teeth have no need of gold cusps and are attached by two pins on each proximal surface. A backing passed around the palatal surface of the tooth and over the pins encases the tooth in a half socket made of gold or platinum, which must be increased in thickness by 20-carat gold solder to give the required strength to the whole structure. The teeth, as now made, before being backed, should have their palatal surfaces freely reduced by grinding, so as to give ample strength to the metal without adding to the bulk of the tooth. The essential point is that the metal should have sufficient thickness and strength without the teeth, which are thus securely held in their gold sockets, even though slightly checked. But even a check is to be avoided, for a fracture at the depth of the pins, especially when the metal is thin, would be at once fatal to the strength of the piece."

Dr. George W. Melotte, of Ithaca, New York, contributes the following description of his new method of mounting artificial crowns:—

"I take pleasure in presenting to the profession my method (Fig. 10) of setting porcelain-faced crowns on anterior teeth, which

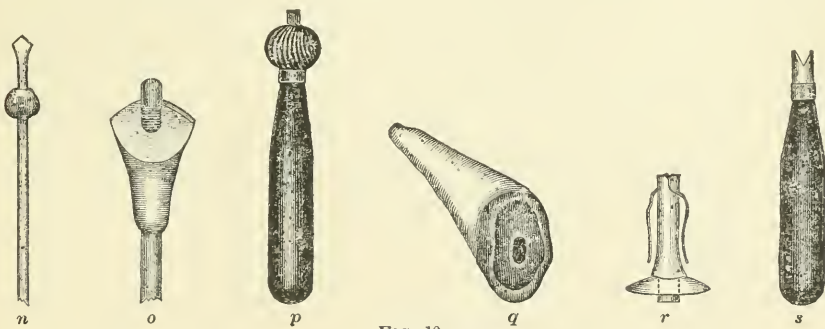


FIG. 10.

for simplicity and easy manner of construction will, I think, commend itself to a larger number of operators than any system with which I am familiar. My manner of preparing the root of a superior cuspid is to first enlarge the pulp-canal with a spear-pointed drill sufficiently to accommodate a strong platinum and iridium pin. In enlarging the canal for the reception of the pin, a piece of hard wax should be placed around the drill near the point, *n*; as the drill advances, the wax recedes, thus indicating the exact

depth to which the drill has passed into the root. With this precaution, and noting the least indication of pain produced by friction, the danger of drilling through the side of the root will be obviated. Next, with a stub corundum wheel, the end of the tooth is made perfectly level and even with the gum. A concave surface is next given the root by means of a tapering reamer having a central pin as a guide, *o*, slightly smaller than the drill used. In cases where the surface of the root is oblong, the edges may be given a uniform thickness by slight pressure toward the portions not reached by the first drilling.

"The hole in the root is slightly enlarged with a fissure burr toward the labial and lingual surfaces, sufficiently to form a key to prevent the turning of the crown. A round platinum cap (No. 32 gauge), slightly larger than the end of the root, is made by means of a steel punch having a central point. The cap is placed upon the end of the root and held securely while the central hole is enlarged by forcing a round, tapering burnisher through the metal, which at the same time forces it into and gives it the form of the marginal opening in the root.

"An instrument having a central pin and a soft rubber cushion, *p*, somewhat larger than, and of a shape to fit, the concave surface of the root, is now firmly pressed against the cap, swaging it into the end of the root and giving an imprint of its edges. The length of the pin being determined, and the lower end flattened so as to give it the width of the opening in the platinum cap, *q*, it is put through the cap into the root and secured by hard wax. Both cap and pin are then withdrawn, invested, and the cap filled with gold solder. The edges of the cap are trimmed with a file to the lines which mark the contour of the root. The cap is now placed in position on the root. A tooth having been lined with gold or platinum, and properly adjusted, is securely fastened to the cap with hard wax, removed, invested in the usual manner, and, after careful heating, the joining is made with gold solder.

"The gold surfaces having been filed and polished, the piece is ready to be mounted. For the purpose of making the pivot perfectly solid, and to obviate the possibility of displacement during the hardening of the cement, a string packing is placed in the notch or slot on the end of the pin and long enough on either side to extend nearly to the base of the crown, *r*. The pivot-

hole and concave surface of the root are made perfectly dry. A thick, creamy paste of zinc-phosphate is prepared, the canal filled and crown forced into place, using an instrument having a notched end, *s.* The expansion of the cotton will hold the crown firmly in position during the hardening of the cement. Crowns may be placed on the roots of the anterior teeth, including the bicuspsids, with such slight modifications in pin anchorages as may suggest themselves.

"Another advantage of this mode of setting is in being able to so form the root and place the crown that the free margins of the gum will cover the smooth edges of the porcelain and gold, giving a perfectly natural appearance at the gum line (Fig. 11), and more perfectly protecting the cement from the secretions of the mouth.

"Another excellent way of setting is to fill the canal with zinc-phosphate just sufficient to enclose the pin, then place a wafer of gutta-percha a little less than the size of the platinum cap over the end of the root, warm the crown enough to make the gutta-percha plastic, and force it into place."

Dr. W. Storer How,² of Philadelphia, thus describes his "Mode of Mounting the New Richmond Tooth-crown:"—

"The usual preliminary treatment of the natural tooth-root and the filling of the apical fourth part of the pulp-canal are predicated on all the cases which will here be described and illustrated, in exempli-

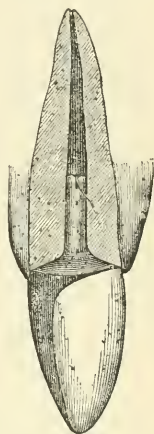
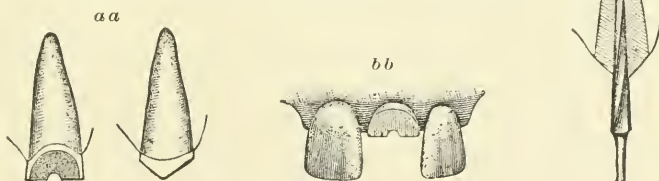


FIG. 11.

FIG. 12.
(Dental Cosmos.)

fication of the preferred mode of mounting the new porcelain tooth-crown invented by Dr. C. M. Richmond.

"A superior left central incisor root will serve as a typical case, and its projecting end is to be shaped as shown in Fig. 12 (*aa* and *bb*). This can be rapidly done with a narrow, safe-sided, flat or

square file, the angles of the slopes being such that the gum on the labial and palatal aspects will not interfere with nor be disturbed by the operator in this preliminary work, for the root-end is not at this time to be cut quite down to the gum. An Ottolengui root-reamer, *cc*, is then employed to bore out the root to receive the crown-post, which is of the same size and shape as the Logan crown-post for a central incisor. *cc* shows in section the relation of the reamer to the root. The new Richmond crown as shown in Fig. 13 (*ddl*) is then put on the root, *cc*, and its position relative to the adjacent and occluding teeth noted. If the cutting-edge of the crown is to be brought out for alignment with its neighbors, the root can be drilled a little deeper, and the reamer pressed outward as it revolves to cut the labial wall of the cavity. The palatal root-slope must then be filed to make the V correspond to the changed inclination of the crown. The palatal root-slope must then be filed to make the V correspond to the changed inclination of the crown.

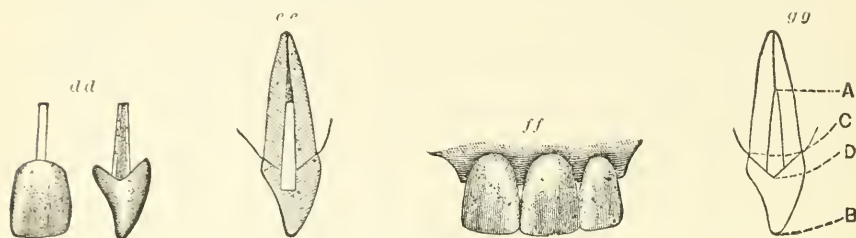


FIG. 13.
(*Dental Cosmos.*)

“Thus, by alternate trial, and reaming, and filing, the crown may be fitted to the root and adjusted in its relations until the post has a close, solid bearing against the labial and palatal walls of the enlarged pulp-cavity, and the crown-slopes separated from the root-slopes by a thickness of a sheet of heavy writing-paper. This space can be accurately gauged, and the root-slopes conformed to the crown-slopes by warming the crown and putting on its slopes a little gutta-percha, so that an impression of the root-end may be taken, and the root-slopes dressed with a file until the film of gutta-percha proves to be of equal thinness on both slopes. After thus completing the adjustment, with due attention to the alignment and occlusion, the crown and the root are to be dried as thoroughly as possible.

“To do this effectively in the root, it should first be swabbed and washed out with absolute alcohol, and then continuously flooded

with warm air, until the root is not merely dry, but dried throughout as far as possible, and made so warm as to render the patient conscious of its heat. A little gutta-percha is then put on the sides of the post and over the slopes of the crown, which is then pushed into place, the exuding gutta-percha cut away, and the joint smoothed with a warm burnisher. The film of gutta-percha should be very thin. The crown and root may be quickly cooled by the use of the syringe with cold water, and the patient then enjoined to let the crown rest for a few hours in order that the gutta-percha may become quite set. *ff* shows the completed crown.

“Dr. Richmond usually takes a thin, perforated disk of gutta-percha, pushes the post through it, warms the crown, presses it into place, and when cooled removes the crown, and with a sharp knife trims away the gutta-percha close to the crown-neck. He then warms the crown, puts a very little oxyphosphate cement on the post, and presses the crown home.

The obvious advantages of the device are the readiness with which the slopes of the root-end may be shaped with a file; the facility with which these slopes may be given any angle to set the crown out or in at the base or at the cutting-edge, or to give it a twist on its axis; the certainty that, once adjusted, the final setting will exactly reproduce the adjustment; the assurance that in use the crown will not be turned on its axis,—a most common cause of the loosening of artificial crowns; the firmness of its resistance to outward thrust in the act of biting. This fact is made apparent by *gg*, wherein it will be seen that in an outward movement the crown B must rock upon A as a pivot, while the dotted line D shows how the crown-slope is resisted by the root-slope, which extends so far toward the incisive edge that a much firmer support is given to the crown than if the resistance should be, as it usually is, on the line of the gingival margin C.

“The cases for which the new crown seems specially adapted are such as have some considerable portion of the natural crown remaining, and for these it would seem that no better artificial substitute has yet been made accessible to the profession.

“For roots that have become wasted below the gum-surface the new crown is not suitable, except in such cases as are decayed

under the labial or palatal gum-margin only, but have yet projecting the approximal portions of the crown (see Fig. 14).

“The sectional view (*hh*) and the perspective plan views (*ii*) illustrate the manner of mounting these crowns on this class of roots. The finished crown appears as in *jj*. The successive steps of the process must in every instance be taken with prudence, skill, and judgment, while carefully considering every circumstance and detail as progress is being made in the operation. For example, in the fitting of the crown to the root it will require nice observation and discrimination to determine whether the crown is resting on one or both of the root-slopes or on the post-slopes in the reamed canal. Emphasis on the necessity of due attention to all the considerations connected with the adaptations and manipulations of these crowns appears all the more requisite when one observes the avidity with which thoughtless enthusiasts take hold upon a new device and

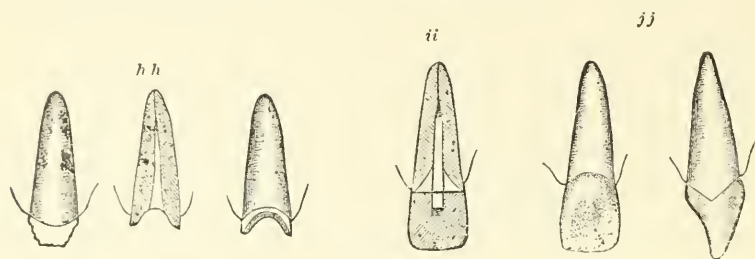


FIG. 14.

off-hand declare, ‘That is certainly a good thing! I will try it on the next case I have.’ Without the slightest hesitation it is tried on the very next case (which is likely to be an unsuitable one), and the trial results in failure because of the heedless assumption that a tooth-crown or any other thing which is obviously a good thing in the precise relations for which it had been designed and fitted is hence good for use in any case that may present. The fault of such failure will be inconsiderately charged against the crown or its inventor by both the disheartened patient and the heedless operator.

“It must therefore be clearly understood that not every thing is claimed for the New Richmond Tooth-crown. Some of the methods of employing it in suitable cases are here described and illustrated in order to furnish the profession an additional means for meeting the constantly varying demands upon the skill and resources of its members in repairing the ravages of dental decay and loss.”

ORTHODONTIA.

ETIOLOGY OF DENTAL IRREGULARITIES.

From the time that irregularity of position of the human teeth first commanded the attention of the dental practitioner, speculation on as to the cause of the abnormal condition has been indulged in.

Later on, investigation was instituted, and as a result many of the causes operative in the production of irregularity have been determined, while others are receiving full attention at the hands of our ablest investigators.

In earlier times, the attention of the profession was naturally most engaged in correcting the deformity and in devising suitable mechanical devices by which to accomplish it. More recently, however, since a more correct knowledge of the anatomy and physiology of the involved parts has been obtained, and theoretical and applied mechanics have been laid under tribute in the devising of numerous and more perfect appliances by which the correction of the condition is rendered comparatively simple, the best thought of the profession is being directed with renewed interest to the more thorough investigation of the causes responsible for the abnormality.

These causes are necessarily both pre- and post-natal, each in turn exerting its influence and contributing its share toward the general result. Concerning the influence of heredity as a factor, Prof. A. H. Thompson, of Topeka, Kansas, says:—

“Like all other organs and tissues, the development of the physical peculiarities of the teeth is under the control of omnipresent hereditary influences, immediate and remote. In no class of organs is the effect of inheritance by variation due to changed conditions so marked as in the teeth of man.

“In man, transmitted variations are now under the domination of that artificial life with which he has surrounded himself. He is far removed from a state of nature in the environments of civilization, and as a result the variations at present in progress in the species are rather detrimental than beneficial to his physical perfection and normal integrity of structure. This is especially

noticeable in the tendency to transmit imperfections and disease, so conspicuously manifested in civilized man to-day.

"Not only is the type of a tooth usually determined by the impress of one or another of the parents, but the particular defects and deformities are the result either of parental impression or of unfortunate temperamental or consanguineous combinations."

Speaking further concerning the influence and effects of the intermarriage of races, he says: "An interesting branch of this subject is the study of the effects of racial crossing, miscegenation, upon the arrangement and structure of the teeth. We know that persistence of the peculiarities of race is one of the wonders of heredity, and that by its powers the permanence of racial characteristics is rendered possible. Races of men exist to-day whose ethnic features have remained unchanged through centuries, and will remain, because comparative purity of race has been maintained. If racial persistence is so strong, it is not strange that mixture of races, and the conflict of various and often conflicting and heterogeneous qualities and incompatible tendencies of structure, should eventuate in imperfect, malformed and deteriorated organization. We find this to be the case as regards the teeth in the unfortunate combination of large teeth with small jaws, first described by Dr. J. H. McQuillen, and that this is a prime cause of irregularities of various kinds."

Upon this question of etiology, Dr. L. Ashley Faught, of Philadelphia, writes: "It is impossible for any one to record an exact statement of the causes which induce either hereditary or acquired irregularity. They are imperfectly understood. Yet, much is known, and much in addition may be inferred by analogy, which, until the truth is reached, may be accepted as a plausible explanation. For instance, in respect to the hereditary feature, nothing is clearer than the fact that organization is transmissible; and nothing is better established than that the bodily conditions of one or both parents may find reflection in the offspring. If the features of the general construction of the parents therefore are similar, modified or exaggerated types will appear in the children, yet in all probability in harmony; but if their general construction vary greatly by a difference in nationality, or in size,—one may have large teeth and large jaws, and the other small teeth and small jaws,—the children of such parents will not unlikely present

a dental irregularity, as they may not inherit the jaws and teeth from the same parent. The large teeth being taken from one parent and the small jaws from the other, the disparity in relationship gives rise to a crowded and inharmonious denture. While this is not positively proven to be the source of this form of irregularity, it is reasonable to believe it to be from the constant coexistence of the conditions and facts."

In regard to post-natal influences, the same writer, speaking of the extraction of the permanent teeth as a factor in the production of irregularity, says: "Such extractions may be simply an effort, without due consideration of the effect of the loss upon the arch and occlusion, to rid the patient of an offending member which should have been subjected to operative treatment and saved; or it may have been done with a view to correcting an already existing irregularity.

"That judicious extraction of the permanent teeth to correct or to prevent irregularity is right and proper, the results have proven again and again; but the too strong tendency to thus simplify a case by such radical means needs to be checked by a word of warning; for such meddlesome interference has often led to the production of a sad irregularity. Nature will do all in her power to combat opposing influences and bring about harmony, and her inherent powers in this respect are very strong, and in most cases may be relied upon. They certainly should be, unless knowledge sure and positive dictates the assistance.

"Perhaps the best way to indicate injudicious extraction without a study of individual cases is to give general rules for governing judicious extraction. They have been tabulated by Prof. S. H. Guilford³ as follow :—

"(1) Avoid, if possible, extracting any of the six anterior permanent teeth in the superior arch. (2) In the lower jaw, any one of the permanent incisors may be extracted to gain space, without harm. (3) Back of the anterior teeth, if all are equally good and one must be removed, select the one nearest and posterior to the one out of position. (4) If a tooth other than the one nearest to that in malposition be defective, and it be not too far back of it, extract it instead. (5) If a tooth must be lost, either to allow a more important one to fall into line or to create space, it should be done without delay to accomplish the best

results. (6) If a tooth on one side must be removed to obtain space, it does not necessarily follow that its opposite mate should also be extracted. (7) Where there is disparity in size between the two jaws, and two teeth need to be extracted from the more prominent one, it would be a serious mistake to extract the corresponding teeth in the other and smaller jaw. (8) If appearances indicate that certain teeth may have to be removed at some time before the case is completed, though not in the beginning, perform all the work possible first, and then extract, if necessary."

In continuation of the subject of the causes influencing the acquired forms of irregularity, Dr. Faught says:—

"Delayed eruption of permanent teeth may be mentioned as a not infrequent cause of irregularity. The trouble liable to arise under such circumstances is the opposite condition to that of the crowded arch. The teeth erupt so slowly that unsightly separations occur which are difficult to correct.

"Accidents also contribute their quota to irregularity of the teeth, operating in different ways. A fall occurring at the period of tooth-eruption has been known to produce serious results. So, too, in the operation of lancing the gums for the incisor teeth, upper or lower, the cut being made too far backward or too far forward, may serve to lead these teeth out of their normal positions, which deformity may subsequently be aggravated by the occlusion of the teeth in the opposite jaw.

"The loss of teeth from an already completely formed set through blows or falls has been the occasion of starting an irregular condition in what was previously a regular arch, and which, but for the accident, would in all probability have remained so. From such accidents teeth may become disarranged in position without any of them being lost, and, not being promptly pressed into their original position, become fixed in the new but irregular relationship. The writer recalls a case in which the lower incisors were thus made irregular in a lady's mouth by force exerted upon them through being brought in violent contact with a powerful pet dog, who made an unexpected jump at her throat.

"Aside from hereditary consequential deformity, which may itself have thus originated, there are few more productive causes of irregularity than lip-sucking, thumb-sucking and tongue-sucking."

Dr. F. H. Chandler thus writes:⁴ "In deformity from this cause there is often found in the portion of the mouth just back of the incisors a hollow in the palatal bones, into which the little victim's thumb has fitted, and which has itself been moulded by and on the thumb. The front teeth are projected forward, sometimes spread out like a fan, but commonly at an angle, overlapping one another and pushing out the upper lip, giving the face a prognathous appearance, while the whole upper jaw has a stretched look, as though it had been drawn out while soft and become hardened in that position,—as indeed is the fact.

"In the lower jaw a reverse deformity often occurs. From the position taken by the thumb, while the upper jaw is drawn out, elongated and narrowed, the lower is pushed back and shortened, flattened in front and protruded at the sides, so that the articulation of the lower molars is thrown outside of their corresponding upper teeth,—an inverse 'wrapper jaw.' The bones of the ramus and of the infantile jaw itself, while soft, are at times literally bent back, causing the bite of the lower teeth to be an entire tooth back of its normal position; while the front portion of the jaw containing the incisors is bent upward, so that the crowns of these teeth come close to or actually bite into the gum of the upper jaw. This is a kind of irregularity which little or nothing can be done to remedy, and the poor victim must go through life deformed and suffering from the consequences of the ignorance or weak indulgence of parents or nurse.

"Not infrequently this bending back of the lower jaw is such that as the second set are developed each molar strikes in turn and takes the bearing off from the anterior tooth, until at length the wisdom-tooth takes the whole bearing, and the mouth can no longer be closed, the front teeth being kept apart sometimes as much as a quarter of an inch, entirely preventing proper mastication of the food, interfering seriously with speech, and greatly impairing the looks. The powerful pull of the temporal muscles, and frequent shocks both in the act of mastication and the numerous accidents of life, often set up inflammatory action in these unsupported teeth, and after more or less intensity of suffering cause their final loss. The same process is then set up in the teeth immediately anterior to these, the second molars, and they in turn are lost; and so on, until the patient has no molars for mastication,

and all the work of pulping the food comes upon the weak bicusps and front teeth.

“In the general category of thumb-sucking, we may reckon finger-sucking of the fore and middle finger; lip-sucking, usually but not always the under lip; and tongue-sucking, which deforms either side or the front of the mouth, according as the child favors one or the other position for its tongue. In this latter case, the whole of one side may be pushed out beyond its proper articulation, throwing the upper teeth entirely over and outside of the under ones in such a way that they not only become a disfigurement, but are wholly useless for purposes of mastication. The tongue also buries itself deeply in the soft bones of the palate, and there leaves its mark indelibly impressed, greatly injuring the voice and interfering seriously with, or rendering impossible for life, distinct articulation. These practices are not less harmful than thumb-sucking, inasmuch as they can and do go on at all hours of the day and night, whether sleeping or waking, and from their nature are less susceptible of correction than the latter.”

Enlarged tonsils are also to be enumerated as occasionally being the cause of irregularity. When they enlarge upward, they may obstruct the posterior nares or compress the Eustachian tubes. Owing to the passage of a less quantity of air through the nasal and oral passages a diminished volume enters the lungs, and as a result in children the nasal passages do not increase in capacity proportionately in size with the growth of the child. The palatine arch is also so retarded in its growth that the alveolar process of the upper jaw is small and the teeth crowded.

In the last place, we desire to refer to the enervation of the trigeminus nerve, as a cause of irregularity. Indeed, we are inclined to believe and endorse the theory of Dr. Kingsley,⁵ that,—

“Laying aside all causes that may be due to an inherited tendency to follow or exaggerate some given type, together with those which are manifestly due to forces operating only after eruption, the primary cause, so far as the individual is concerned, of any general disturbance in the development of the permanent teeth, showing itself particularly in their malposition, is directly traceable to a lesion of or enervation of the trigeminus nerve; that it is an interference, more or less prolonged, with one of the prominent functions of that nerve, and operating at its origin; that

while I know of no way to prove this assumption by any examination, microscopical or otherwise, while the nerve-centre is under this influence, it is nevertheless sufficiently proven by secondary phenomena which could only have originated from such a source.

"The function of the trigeminus thus stimulated or interrupted is that which supports, regulates, and governs the nutrition of the tissues to which its terminal branches are distributed.

"That such a lesion or enervation would be likely to produce such a result is clearly foreshadowed in the following statement made by the late Prof. Anstie in one of his lectures on the fifth nerve: 'The nervous centre in which the trigeminus is implanted is of all nervous centres the one which in the human subject is most liable to congenital imperfection of the kind which necessitates a breakdown in its governing functions at a special crisis in the development of the organism.'

"I do not find that any writer on the causes of malposition of the teeth has made this direct connection between the abnormality and disturbance of the nerve centre during the formative and eruptive period; but I do find a large array of facts confirmed by my own observations, which to my mind points to this only conclusion; and although other observers of similar facts have attempted in many instances an explanation of what they saw, they have failed to refer them to any satisfactory primary cause.

"Recognizing as we must the statement of the best authorities that the most rapid growth of the brain takes place before seven years of age, may we not infer a consequent diminution or diversion of formative energy from other organs, particularly the teeth? And so, too, the artificial mode of life in vogue to-day among the higher classes of society brings on a derangement of the trigeminus nerve."

Prof. E. S. Talbot, of Chicago, who has given much attention to this subject, contributes the following:—

"It is an interesting subject to institute a comparison in relation to dental irregularities between the teeth and jaws of the ancients and those of the present inhabitants of civilized countries. The writings of the ancients and an examination of the numerous collections of ancient skulls in existence, furnish us with whatever knowledge we possess, upon which such a comparison may be instituted.

"The relative habits of life and the respective environments of

the different races must also be taken into account in order to arrive at any reliable conclusions. We find that in former times, when the means of subsistence were primitive, and when the various appliances and methods of modern civilization were as yet unknown, mankind subsisted chiefly upon the products of nature in a comparative state of nature. Fruits, nuts, coarse grains and the flesh of animals formed the principal diet; and all of these required an effective and complete trituration in the mouth before being taken into the stomach. As a consequence, the masticatory organs, including the teeth, were constantly subjected to a considerable amount of exercise, which naturally caused a full and healthy development. Consequently and very naturally, we find in the ancient skulls, expanded and fully developed maxillæ and well-proportioned and complete dentures. The relative proportion between the superior and inferior maxillæ is found to be correct; and there is a marked absence of the narrow and contracted arches, and the disproportion between the lower and upper jaws now so frequently observed.

“The present methods of subsistence largely do away with the necessity for mastication; and as the habit of bolting food is very common, the teeth and jaws get little exercise. The intermarriage of races has often been mentioned as one of the causes of the existence of irregularities; while the premature ossification of the sutures is by some supposed to arrest the development of the superior maxilla. It seems, however, more reasonable to ascribe this effect to the cause first mentioned, as we elsewhere find that exercise or action develops organs, whilst the lack of it results in atrophy or arrested development.

“The foods of to-day are largely prepared for deglutition by artificial means, and proper mastication is therefore neglected.

“The formation and development of the maxilla form an interesting study. In intrauterine life, the alveolar processes form a cover to the crypts in which the embryonic dental organs are developing. As they increase in size, these latter push through the bone, which is removed by absorption to make way for them. When they have erupted, the alveolar process is formed around the teeth, affording them self-support during their subsequent retention in the jaws.

“This process is repeated in the shedding of the temporary and

eruption of the permanent teeth; and after these are finally lost the processes are again absorbed, leaving only the denser portions of the bones. These repeated changes, however, affect only the processes, and not the body of the bones. The position of the teeth in their crypts influences the position which the alveoli subsequently occupy, and consequently that of the dental organs. A larger or smaller circle is formed, according to whether the teeth present toward the outer or inner aspect; and the loss of several teeth of one jaw causes a projecting or elongation of the alveolus of the opposite jaw, thus deprived of an antagonizing support.

“The comparatively earlier age at which the teeth of succeeding generations are lost by decay would tend to reduce the diameter of the alveolus, which is thereby rendered unnecessary or useless.

“Exanthematous diseases also have a tendency to cause arrest of development of the maxillæ, as may also any serious constitutional disorders. It is noticeable that a marked concomitant of idiotic or feeble-minded constitutions is an arrested development of the maxillæ. Some observers have found that with few exceptions congenital idiots have arches contracted in the regions of the bicuspids, and that with them irregularity of the teeth is the rule, rather than the exception.

“Observations made by others, notably Drs. Kingsley, of New York, and White and Stellwagen, of Philadelphia, do not corroborate this view. Yet it cannot be denied that this class of persons furnish more examples than an equal number of normal minded; and these examples are confined to no one type of irregularity, as will be noticed in the table on following page:—

“Table I gives the result of an examination made for deformities of the jaws in the Iowa Institution for Feeble-minded children, Glenwood, Iowa. Examination made by Dr. F. M. Powell, Sup’t.

“Table II presents the result of an examination made for similar purpose in the Institution for Feeble-minded children, Lakeville, Conn. Examination made by Drs. G. L. Hurd and G. H. Knight, Sup’t.

“Table III gives the total number of deformities of the jaws of both sexes in each grade, in above-named institutions, including former examination.

“Table IV gives the total number of deformities of the jaws of both sexes in all grades in said institutions.

TABLE I.—HIGH GRADE.

No.	Sex.	Normal.	Large jaw.	Protrusion lower jaw.	Protrusion upper jaw.	High arch.	V-shaped arch.	Partial V-shaped arch.	Thumb-sucking.	Saddle-shaped arch.	Small teeth.
77	Male.	50	8	4	11	15	5	9	.....	12	.....
27	Female.	11	12	3	1	4	2	1	.....	3	.....
104	.....	64	10	7	12	19	7	10	.....	15	.....

MIDDLE GRADE.

51	Male.	8	22	3	6	6	4	4	.....	7	.....
42	Female.	13	17	3	12	7	4	3	.....	5	.....
93	.....	20	29	6	18	13	8	7	.....	12	.....

LOW GRADE.

47	Male.	18	14	7	4	8	6	5	.....	8	.....
51	Female.	13	12	3	10	16	7	5	.....	12	.....
98	.....	31	26	10	14	21	13	10	.....	20	.....

TABLE II.—HIGH GRADE.

No.	Sex.	Normal.	Large jaw.	Protrusion lower jaw.	Protrusion upper jaw.	High arch.	V-shaped arch.	Partial V-shaped arch.	Thumb-sucking.	Saddle-shaped arch.	Small teeth.
32	Male.	25	4	1	4	8	2	5	.....	1	9
26	Female.	17	1	3	7	13	3	2	.....	.	6
58	.....	42	5	4	11	21	5	7	.....	1	15

MIDDLE GRADE.

9	Male.	7	2	1	3	3	1	2
---	-------	---	---	---	---	---	---	---	-------	-------	-------

LOW GRADE.

10	Male.	7	3	1	4	1	1
----	-------	---	---	---	---	---	---	-------	-------	-------	-------

TABLE III.—HIGH GRADE.

No.	Sex.	Normal.	Large jaw.	Protrusion lower jaw.	Protrusion upper jaw.	High arch.	V-shaped arch.	Partial V-shaped arch.	Thumb-sucking.	Saddle-shaped arch.	Small teeth.
334	Male.	190	33	10	36	84	16	44	12	51	16
228	Female.	132	14	14	17	57	15	12	51	23	14
562	.....	322	47	24	53	141	31	56	7	74	30

MIDDLE GRADE.

434	Male.	261	34	19	22	41	25	45	1	33	11
316	Female.	195	17	9	18	26	16	46	5	24	12
750	.....	456	51	28	40	67	41	91	6	57	23

LOW GRADE.

271	Male.	97	37	23	32	55	33	39	7	37	9
394	Female.	220	27	17	34	56	24	50	11	39	9
665	.....	317	64	40	66	111	57	89	18	76	18

TABLE IV.—TOTAL NUMBER OF DEFORMITIES OF THE JAWS OF BOTH SEXES IN ALL GRADES.

Total No.	1977	Protrusion lower jaw. 92	V-shaped arch.	129	Thumb-sucking.	31
Normal.	1095	Protrusion upper jaw. 159	Partial V-shaped arch.	236	Saddle-shaped arch.	207
Large jaw.	152	High arch.	318	Small teeth.	71	

"We divide the idiotic classes into high, medium and low grade, and the condition of the jaws in each class is a distinct and marked characteristic. High, V-, and saddle-shaped arches are frequent in both foreign and American idiots, but thumb-sucking cases are few in number in this country.

"The influence of heredity in producing irregularities is very marked, and in no degree second to its application in other particulars, which is too well known to require comment. It is, however, far from constant, and sometimes disappears or reappears in a most surprising manner. Not only are perverted development, deformity or irregularity of the teeth thus transmitted, but peculiar malformations of individual teeth are often very markedly prominent. A child may in one jaw reproduce paternal characteristics and in the other those of the mother; or the child may inherit the dental development of the mother, combined with the maxillary development of the father. Ante-natal influences may be among the causes of deformities; but this is a matter which is scarcely susceptible of proof. How much either this cause or heredity has actually to do with dental irregularities, is a difficult matter to be determined. Local causes may either keep or hinder the heredity tendencies, and thus greatly modify the results. Strong corroborative evidence of this fact is afforded by several practical cases. I recall one case in particular, of an irregularity of the teeth of a mother, showing the absence of the lateral incisors, which were extracted at the age of 13; the cuspids, bicuspid and molars having come forward and filled the spaces thus created. The mother's teeth are small, while the father's are large. Those of the two children follow the character of the father as to size and strength, but the tendency to irregularity shown in the mother is reproduced in the upper jaw of each of the children. The irregularity of the children's teeth does not resemble that of the mother's, nor do they resemble each other. Local influences modify each case.

"An examination by Messrs. Cartwright and Coleman in 1864, of a large number of skulls some centuries old, deposited in the crypts of Kythe Church, Kent, showed the alveolar processes and teeth to be perfect in development and form. Mr. John R. Mummery, of London, has given the results of an extensive examination of the skulls of over 300 ancient and modern uncivilized races, which show that in an early and uncivilized condition the teeth were

freer from irregularities than those of the moderns. Dr. Nichols, of New York, confirms this statement by the examination of Indians and Chinese, among whom he says it is very rare to find an instance of abnormal arrangement. This statement accords with my own observations among the Chinese on the Pacific Coast.

"From these facts we may infer that hereditary irregularities may result from the union of different races, causing the offspring to partake of the characteristics of both parents. It seems certain that the nearer man remains to the primitive condition, the better the teeth and the more normal the arrangement.

"Higher states of civilization and higher types of the individual seem to carry with them imperfection of structure and abnormality in arrangement, and the tendency of modern civilization is to increase and amplify these conditions.

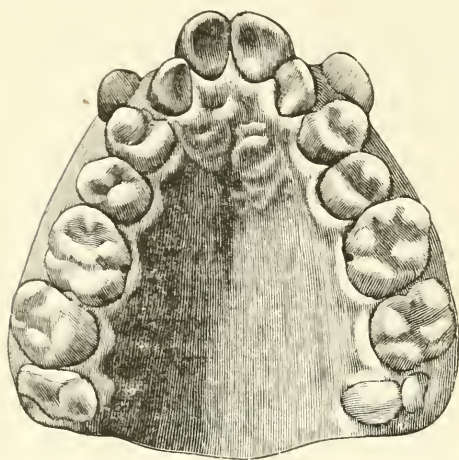


FIG. 15.

"This may result in either the V-shaped or saddle-shaped arch. The former (Fig. 15) is found in the superior maxilla alone, and only in connection with the permanent teeth. In this condition, the centrals are rotated so that their mesial surfaces present anteriorly, and the long axis of the crown is directed forward,

carrying the process with it. The laterals are similarly placed, while the cuspids may be found either in line or partly outside. The posterior teeth are directed forward and inward, and the teeth are crowded. Sir John Tomes says that this malformation is associated with enlargements of the tonsils, which necessitates breathing with the mouth open.

"Various causes have been assigned by different authors as contributing to this condition. Dr. Kingsley thinks it congenital; Mr. Oakley Coles considers that premature ossification of the sutures produces it; and Mr. Cartwright attributes it to high breeding and luxurious habits. Thumb-sucking has also been

considered as an active cause, Mr. Ballard, of England, even taking the ground that this habit is a forerunner and cause of idiocy.

“The manner of eruption of the teeth does not show the influence of hereditary tendencies. The first permanent molars are firmly anchored, and form a point of fixed resistance; while the central incisors form a wedge,—a form which is also shared by the laterals. To the force thus exerted the thin alveolus readily yields, the bicuspid following in course, and lastly the cuspids, which by their formation and position exert great power. If room be insufficient they will force the lateral incisors forward and inward, carrying forward the crowns and rotating them in their sockets.

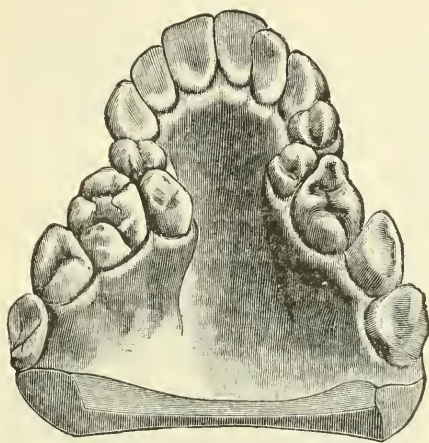


FIG. 16.

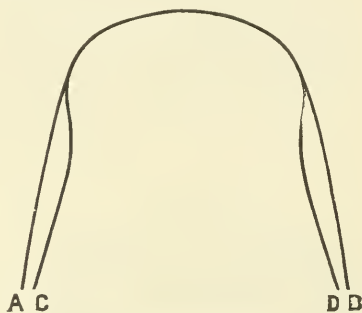


FIG. 17.

“The tongue assists in this, being restricted in space by the narrowing of the arch. Premature removal of temporary molars causes the bicuspid and molars to press forward, resulting in a V-shaped arch.

“The saddle-shaped irregularity (Fig. 16) is usually found in the superior maxilla only, although at times it exists in the inferior.

“The teeth in this variety are in close proximity and stand vertically. The alveolar process is less in diameter than the body of the bone and situated on an inner border, being deflected inward at the bicuspid region and outward at the second and third molars. The cuspids may be in a normal position or forced outward and forward. The causes of this deformity may be seen in Fig. 17, showing the dwarfing of the alveolar process. Instead

of the teeth taking position as shown by line A B, they assume the position C D. The position thus shown may be either natural or the result of the deflection of the follicles by the remaining roots of the temporary teeth. On the eruption of the cuspids, they form a fixed point of resistance, protecting the incisors from the encroachment of the bicuspid. The want of sufficient space carries the bicuspid inward, and the cuspids are, by the pressure of the tongue, carried forward and outward. Frequently only one of the bicuspid is forced completely inward and rotated in its socket. The alveolar process is built up around the teeth in the position they occupy when erupted, giving them firmness in that position.

"The high-vaulted arch is always a concomitant of the saddle-shaped irregularity. The latter is more infrequent than the V-shaped. As in the former condition, the normal eruption is abandoned, and the cuspids precede the bicuspid. The lateral displacement of the second and third molar in this condition is due to the pressure of the tongue on the posterior hard palate in

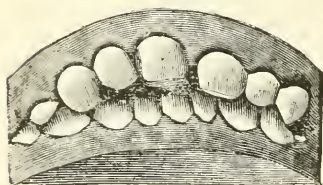


FIG. 18.

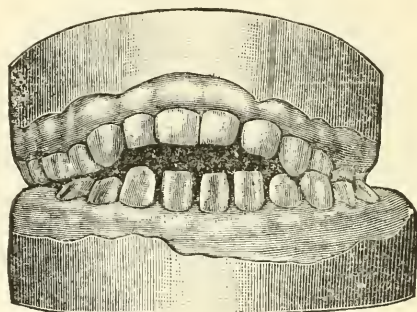


FIG. 19.

the act of swallowing, which is a consequence of the contracted anterior portion.

"This is an infrequent cause of irregularity of the teeth, nor are its effects either constant or considerable. The teeth may be prevented from erupting, or the alveolar process from developing, by the pressure.

"The teeth of the superior maxilla may be forced forward and those of the inferior carried backward, as seen in Fig. 18. The inferior maxilla itself may be forced backward until the ramus forms a right angle instead of the normal obtuse one.

"Another form of irregularity resulting from thumb-sucking is shown in Fig. 19. In this case the thumb was carried into the

mouth at right angles with the teeth, although the temporary teeth were fully erupted, the pressure of the thumb preventing the alveolar process from developing. The rotation of the thumb caused the lower jaw to be carried to the left, the distance of half the width of the molars.

"The V-shaped arch is not found in connection with thumb-sucking, but rather the oval shaped. The second set of teeth are rarely affected by the habit, unless formed at an early age, when the bones are soft and impressible and the teeth readily moved. It rarely continues long enough to affect the permanent teeth; but if it does, they will be affected in a manner similar to the temporary set. The fan-shaped protrusion and the oval-shaped alveolus are very marked, separation between the teeth being always present. There may be present either the flat or the vaulted arch, as this habit is seldom productive of any effect on the hard palate. The engraving (Fig. 20) is taken from the collection of Dr. E. D. Swain, of Chicago, and shows a deformity of the permanent teeth

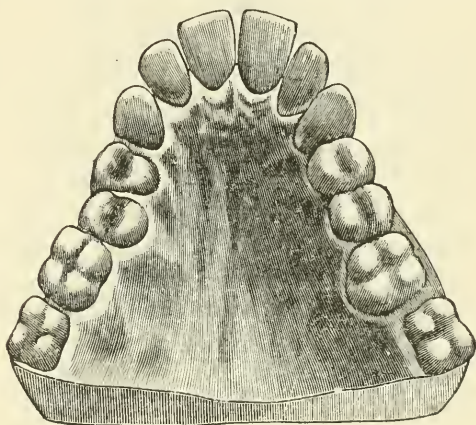


FIG. 20.

as a result of thumb-sucking, with a flat, hard palate. The anterior teeth are protruding, fan-shaped, with spaces between them. These peculiarities are always noticeable in this deformity."

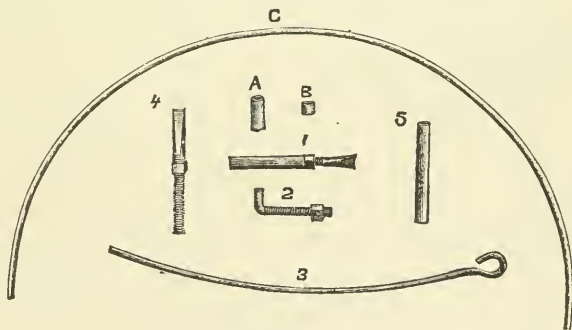


FIG. 21.

Correction of Irregularities.—Upon this practical subject the following two papers have been contributed, each presenting valuable methods for the reduction of dental deformities.

Prof. E. H. Angle, of Minneapolis, thus describes his system for correction of dental irregularities and subsequent retention of the teeth, *in situ*:—

“For accomplishing the different movements of the teeth, I use the following simple appliances, viz.: Fig. 21 shows two forms of the screw, one for pushing, as shown at 1; one for pulling, as shown at 2; and a lever for rotation, as shown at 3. For making and using the appliances, use Stubb’s steel wire of two sizes. You will also need jeweler’s gold-plated wire and hollow wire; or, as it is known among jewelers, joint-wire, which may be of either gold or silver, and a few pieces of piano-wire. The screw for pushing is made by cutting a thread on a piece of Stubb’s steel wire of the desired size and length; one end of the screw is beaten flat, and to the other end is screwed a small nut made of platinized gold. This complete is shown at 4. A piece of the joint-wire is now sawed off the desired length, shown in 5. The screw is slipped into this pipe and the whole is now complete and ready for use, as shown in Fig. 31. This style of screw may be made of any size or length,—the largest I have yet made being $2\frac{1}{2}$ inches in length, and the shortest, $\frac{1}{4}$ of an inch.

“The traction screw is made of Stubb’s steel wire in a similar manner to the screw thus described, with the exception that one end of the screw is bent sharply at right angles. The screw complete is shown at 2. The entire length of the screw is about $\frac{3}{8}$ of an inch, the bent portion being $\frac{3}{32}$ of an inch.

“The lever is made of a piece of piano-wire (15 gauge), about $2\frac{1}{2}$ inches in length, bent at one end into the form of an eye. It is shown complete at 3.

“Rotation by means of this instrument is accomplished by banding the tooth to be rotated. Before cementing the band in position on the tooth, a piece of joint wire, $\frac{1}{8}$ inch long is soldered to the band on the labial or buccal surface at right angles to the long axis of the tooth. The straight end of the lever is inserted into the little pipe attached to the band, while the other end is sprung round and made fast by a wire ligature to the tooth nearest the eye in the end of the lever. Fig. 22 shows an incisor being rotated by this method.

“After the tooth has been moved into position, it is retained by removing the lever and inserting a piece of the gold-plated wire

into the tube from the opposite side long enough for the end to rest on the labial surface of the tooth adjoining, as shown in Fig. 23. The piece of wire is prevented from turning or working out by passing a fine drill through the pipe and one side of the wire and inserting a neatly fitting pin into the hole thus made.

“Instead of securing the end of the lever by means of the ligature, perhaps a better method is to bend the end of the lever sharply at right angles, hooking it into a short piece of the joint wire ($\frac{3}{8}$ of an inch long) soldered to a delicate band encircling the

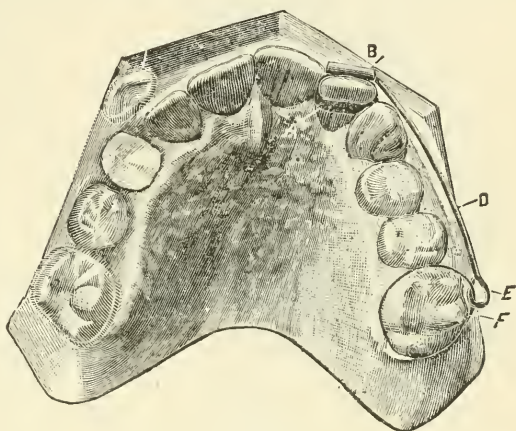


FIG. 22.

anchor tooth on a line parallel with its long axis. It is rarely necessary to cement this band in position upon the tooth.

“The lever may also be applied in rotating on the inside of arch, bending it into any shape to gain leverage and prove least inconvenient to the patient. In especially obstinate cases, two levers may be used, one on each side of the arch.

“For accomplishing the movements of a tooth from within outward into the line of the arch, the screw for pushing, as first described, is used in the following manner, viz.: The tooth to be moved is banded and piped in the same manner as described in rotation. Then on the palatal side of the band is formed a slot, into which is inserted the flat end of the screw. Resistance is gained for the base of the screw by selecting a sufficient number of teeth to completely resist the pressure of the moving tooth.

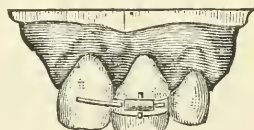


FIG. 23.

“These teeth are banded and piped close to the gum, and on a line with it. A piece of the gold-plated wire is threaded through these little pipes, either before or after cementing the bands in position. Against this wire is placed the base of the pipe encircling the screw. A suitable notch is filed into the end of the pipe to

fit the wire and prevent it from slipping; or, if this wire of resistance is placed on the outside of the arch, as may be done with advantage in many cases, the base of the pipe is made to rest against one of the bands encircling one of the teeth. It is prevented from slipping by soldering it in position, or by plugging the

end of the pipe, and filing it to a sharp point. The point rests in a pit formed in the band. Fig. 24 shows the screw in position on an inlocked cuspid.

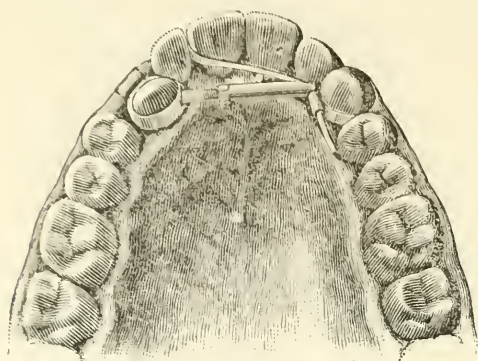


FIG. 24.

“Force is applied by tightening the nut with a small wrench. After the tooth has been moved into the line of the arch, if the movement of rotation is

necessary, the lever is applied, after which it is retained by inserting a piece of the plated wire into the little pipe. The end of the wire resting against the outer surface of the tooth on each side is shown in Fig. 25.

“The movement of a tooth inward into the line of the arch is accomplished by making a band to fit the tooth to be moved. To the palatal side of this band, close to and on a line with the gum, is soldered one of the little pipes $\frac{3}{8}$ of an inch long. Into this pipe is hooked the angle of the traction screw. Resistance is secured by banding and piping one or more teeth on each side of the tooth to be moved, the pipes being soldered close to, and on a line with the gum. Through these little pipes, either before or after cementing in position, is threaded a piece of the plated wire.

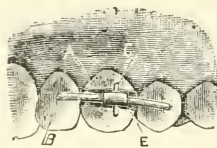


FIG. 25.

“Pressure is now exerted by the screw pulling through and the nut working against the end of another of these little pipes soldered to the wire of resistance. Fig. 26 shows a lateral incisor being drawn into line. The nut is tightened as often as necessary. The end of the screw, as it emerges through the nut, is snipped off from time to time, to prevent it chafing the tongue.

“After the tooth has been drawn into line the wire of resist-

ance and the traction screw are removed, and the tooth is retained in position by inserting a piece of plated wire into the little pipe before occupied by the angle of the traction screw, the wire being long enough for the ends to rest against the palatal surface of the tooth on each side, as shown in Fig. 27. The retaining wire is held in position as described and shown in Fig. 25.

"The movement of a tooth backward in the line of the arch is accomplished in the following manner, viz. :—

"The tooth to be moved is banded and piped. The pipe, $\frac{3}{8}$ of an inch long, is soldered to the front part of the band at right angles to the tooth and arch, and into this pipe is hooked the angle of the traction screw, made somewhat longer for this purpose.

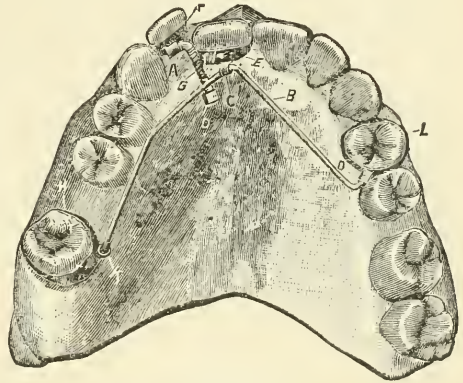


FIG. 26.

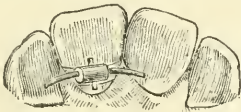


FIG. 27.

The other end of the screw passes through, and the nut works against the end of a pipe soldered to the bands encircling and cemented to the teeth to be used in overcoming the resistance of the tooth being moved. Fig. 28 shows a cuspid being drawn back. The screw may be applied to advantage on the inside instead of the outside of the arch in some cases.

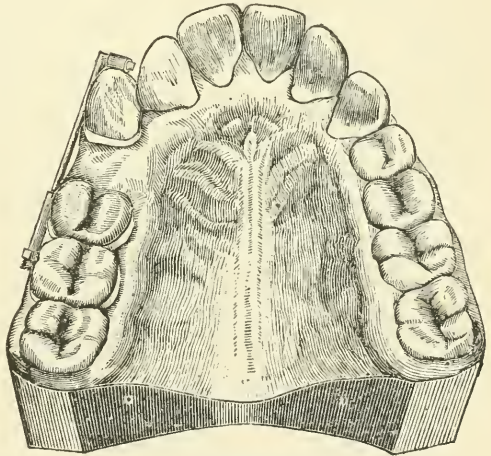


FIG. 28.

"By this method I believe that the annoyance of the anchor teeth moving forward is completely overcome, as these teeth, if moved at all, must be dragged forward bodily through the alveolus,

while the easier and ideal movement of tipping is accomplished in the tooth being moved backward. Rotation is impossible, although the force is exerted on but one side of the tooth. Elongation of the moving tooth is prevented, as the force exerted by the screw has also the tendency to keep the tooth firmly compressed in its socket. The bands encircling the anchor teeth should be a trifle broader than those ordinarily used, accurately fitted and set with the best cement, always first applying the rubber dam over all the teeth being operated upon. It is probably best to encircle all the anchor teeth with bands, attaching each to the pipe with solder, although in similar cases now under treatment I am using but one band encircling the first molar, and apparently with the most gratifying results. The screw should be tightened as often as necessary. As it emerges through the nut and becomes irritating to the cheek, it should be snipped off, or the cheek may be protected by a piece of gutta-percha, warmed and laid over the end of the screw. After the tooth has been moved backward the desired distance, it is retained by the screw already in position, or the screw may be renewed and replaced by a piece of plated wire of the same size and shape, the end being bent sharply at right angles as it emerges from the pipe at the end where the nut worked. Should the movement of rotation be desirable, as is frequently the case with these teeth, it may be easily accomplished either before or after being drawn backward by means of the rotating lever shown in Fig. 21 (3), applied in the usual manner as before described, the end of the lever being inserted into the pipe designed for the angle of the screw.

"The movement of a tooth forward in line of the arch is accomplished in the same way, by selecting teeth from the opposite side to be used in overcoming the resistance of the teeth being moved.

"The movement of elongation is accomplished in the following manner, viz.: A suitable tooth is selected on each side of the tooth to be moved, banded and piped in the usual manner, the pipes being soldered to the band on a line parallel with the long axis of the tooth. A piece of the plated wire of suitable length is bent at each end sharply at right angles and hooked into these pipes. To this wire directly opposite to the tooth to be moved is soldered another of the little pipes $\frac{2}{3}$ of an inch in length,

through which the traction screw, Fig. 21 (2), pulls, and against which the nut works, the angle of the traction screw being hooked into a pipe soldered to a band neatly fitted and cemented to the point of the tooth to be moved. If the tooth is too deeply imbedded in the gum to admit of a band being securely fastened to it, a pit of sufficient size and depth may be drilled into the external surface of the crown, into which may be hooked the angle of the traction-screw. The nut is tightened as often as necessary. This movement of a tooth should be very slow; otherwise, the vitality of the pulp may be endangered. After the tooth has been moved the desired distance, it may be retained by the screw already in position. Fig. 29 shows a central incisor being drawn downward by this method.

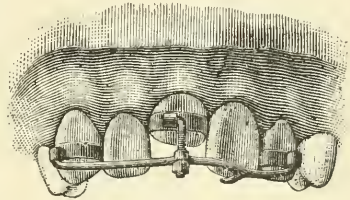


FIG. 29.

“The expansion of the arch is accomplished by placing two bars of the heaviest piano-wire (25 gauge) against the palatal side of the arch, one on each side. They are held in position by the ends in front passing through little pipes soldered to bands encircling the cuspids. The posterior ends are kept in position by the ends of the wire being bent sharply at right angles, and hooked into little pipes attached to bands encircling the last molars.

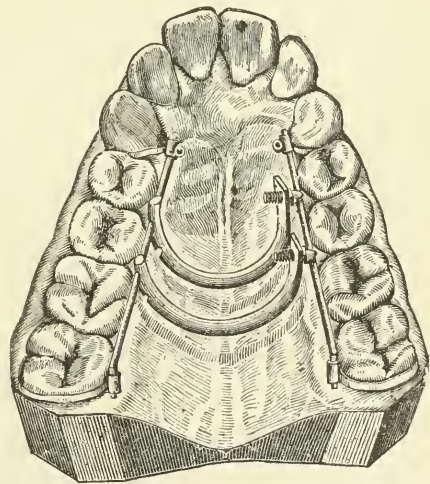


FIG. 30.

“Thus it will be seen that two rigid bars of steel, one in each side, are held firmly in contact with the teeth, as shown in Fig. 30. Pressure may be exerted by placing the screw first described directly across the arch, the opposite ends resting against the bars of steel. Expansion is gained by tightening the nut on the screw.

“A better method of applying pressure against these two bars is to bend a piece of heavy steel wire to conform to the curve of

the arch across from bar to bar. At the side near one end is filed a notch neatly fitting one of the bars which it is to rest against. The other end is beaten slightly flat and a hole drilled through it at a point directly opposite the other bar on that side of the arch. Through this hole is placed the screw for pushing, as shown in Figs. 20 (4). The screw should not be over $\frac{1}{4}$ of an inch in length.

"This appliance is now ready to be placed in position, as shown in Fig. 31. It is in position in Fig. 30.



FIG. 31.

"Pressure is exerted by tightening the nut. After the nut has traveled the length of the screw, the bent wire is removed and straightened a little in order that the screw may have more action. It will be seen in the engraving that two of these screws and braces are used. One is

to remain in position while the other is being straightened, thus preventing the teeth from moving back, as would be the case if but one were used.

"These braces are moved along the bars forward or backward, wherever pressure is needed. After the sides of the arch have been pressed apart the desired distance, they are retained by a straight bar passing across the arch from cuspid to cuspid, the ends being bent sharply at right angles and hooked into little pipes, soldered at right angles to the pipes already described as attached to bands encircling cuspids, and shown in the engraving.

"The incisors are drawn into a line by means of the lever and traction screw, this cross-bar serving as the wire of resistance for the traction screw to pull to.

"This method of expansion may be applied to the lower arch as well, as little interference is offered to the movements of the tongue.

"If several teeth are to be retained in position, one molar on each side of the arch is banded and piped on a line parallel with its long axis. Into this pipe are hooked the ends of a piece of plated wire, bent to conform to the shape of the arch and snugly encircling it. To this wire are attached, by means of bands and pipes, such teeth as should be supported. Fig. 32 shows such a retaining appliance.

"Such is the general method of using these three appliances, but the different ways in which they may be applied are almost innumerable, each case requiring some slight modifications.

"The greatest care and accuracy should be observed in the construction, application and use of them. The little tubes should be of gold and fit snugly, the different parts of the appliances fastened through them. The rubber dam should always be adjusted about the teeth before fitting and cementing the bands into position, and the cement should be of the finest quality. The screws may be made of platinized gold; or if of steel, they should be nickel-plated.

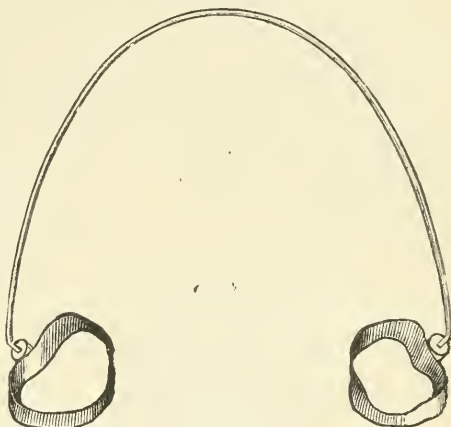


FIG. 32.

"Any dentist of average ability can after a little experience easily construct and apply them, and in most cases in far less time than is required for constructing a vulcanite plate for the same purpose. So securely are they held in position that the annoyance of displacement is entirely obviated.

As the appliance is fitted directly to the teeth, the annoyance of taking impressions and making models is dispensed with, and if sufficient care has been used in its adjustment and the patient be provided with a suitable wrench, he will in many cases do most of the remaining work unaided."

EXTERNAL FORCE IN ORTHODONTIA.

Prof. C. L. Goddard, of San Francisco, Cal., presents the following:—

"Although many new and valuable devices and appliances have been devised within the past few years for the correcting of irregularities,—appliances by which teeth are made to react upon each other,—there are some cases in which we need some point of resistance greater than that which can be found inside of the mouth.

A point of resistance may sometimes be established outside

of the mouth, and in certain cases the back of the head may be utilized for this purpose.

"To illustrate: a patient presented with prominent superior incisors and such long inferior incisors that they impinged upon the gum at the base of the superior. As a consequence, there was no room for a plate to which to attach elastic bands to draw the teeth in. If the crowns of the bicuspid and molars were covered and the bite opened, the inferior incisors would be apt to elongate, and when the plate was removed, would strike on the base of the superior incisors, and force them out again.

"Kingsley's Oral Deformities⁶ describes an appliance for reducing superior incisors in length and prominence, consisting of a swaged plate to cover the incisors, from which standards project and enter two smooth strips of metal resting on the cheek, attached by elastic straps to a cap on the patient's head.



FIG. 33.

"Acting upon this hint, a simple appliance was constructed for the case alluded to as follows, viz.: On a cast of the superior incisors a small sheet of wax was placed, covering the labial surfaces, cutting edges and part of the lingual surfaces. In the anterior surface of this wax plate a steel wire was imbedded, curved to conform to the arch and extending laterally about one inch and a half on each side. The ends of this wire were bent in the form of hooks. The wax plate and wire were then imbedded in a flask by bending the ends of the wire sufficient to allow them accommodation inside of the flask. By the methods usually employed in vulcanite work, a plate was thus made of black rubber, with the wire attached, as shown in Fig. 33.

"When placed on the patient's teeth, the ends of the wires projected from the corners of the mouth on each side far enough to permit elastic bands to connect them with a cloth cap on the patient's head without touching the cheeks.

"The cap was so shaped that the elastic could be attached to it in two places on each side, one above and one below the ear, by means of dress hooks sewed to the cap at these points. Round silk-covered elastic cord was used, and the direction of the force could be varied by using a greater number of strands above or below the ear, according to the requirements of the case. The

amount of force was easily varied by shortening or lengthening these cords. Fig. 34 shows the appliance in position.

"This appliance was worn at night only, and the teeth were soon moved back to the desired position. The inferior incisors striking the basis of the superior incisors, as they were moved back, were moved with them. After the teeth were in proper position, the tension of the elastic cord was slightly lessened and the appliance worn at night for a few months as a retaining appliance until the teeth became firm.

"The greatest use of this appliance is in cases where there are no teeth in the mouth sufficiently firm for the anchorage of an appliance of ordinary form, or where the teeth, if firm enough, are of such shape that it is practically impossible to fasten appliances to them.

"A case treated by Dr. M. S. Gilman of Oakland, Cal., furnishes an example of this character.

"The superior incisors were exceedingly prominent and the upper lip very short.

The patient was a girl of about 13 years of age. To make room for reducing the prominence of the incisors the first bicuspid on each side was removed. A plate was then inserted which was anchored around the second bicuspid and first molar on each side, thus having four teeth to depend upon. The second molars had not erupted far enough to be of any assistance. To this appliance rubber bands were extended over each of the incisors and cuspids to draw them back. The anchorage of the four teeth was not sufficient, and the molars and bicuspid were drawn forward instead of the incisors and cuspids moving backward. Fig. 35 shows the case before and after treatment.

"An appliance such as is illustrated in Fig. 33 was then



FIG. 34.

applied and worn day and night. For two weeks no movement perceptible; but after that the incisors and cuspids began to recede and soon were reduced to their proper position. As the arch was

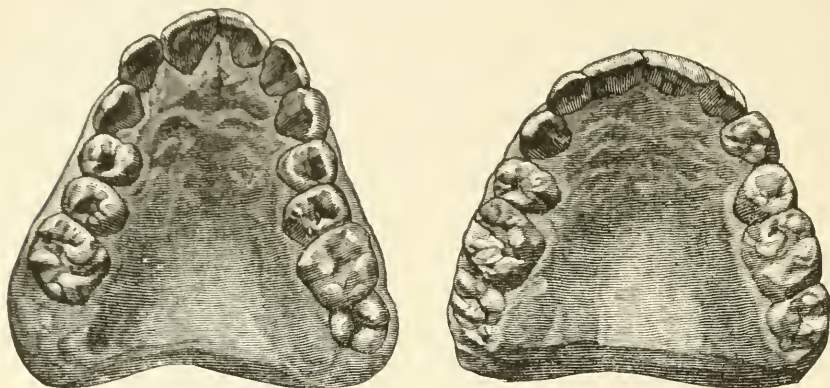


FIG. 35.

narrow, it was spread by means of a jack-screw, and a retaining plate inserted.

“In this case six teeth were easily and safely moved by one appliance, without disturbing the remaining teeth.

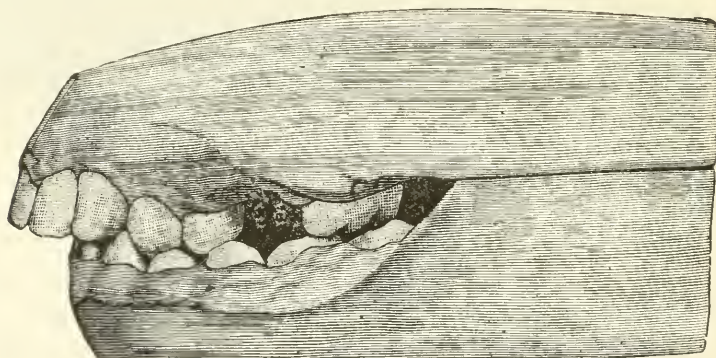


FIG. 36.

“Another case treated by Dr. J. S. Snyder, of San Francisco, Cal., shows still more forcibly the usefulness of the appliance in a case where the incisors and cuspids were too prominent. Figs. 36 and 37 show their relative position before and after treatment.

“The first superior molar on each side was carious, and hence it was deemed best to extract them to make room. The second molars were sound and strong, but the task of moving ten teeth,

incisors, cuspids and bicuspid, with only two teeth available as anchorages, was manifestly impossible.

"The appliance shown in Fig. 33 was used, and thus, by taking the back of the head as the point of resistance, the ten teeth were moved back at one time the width of one bicuspid without unusual discomfort.

"This appliance has been described, not because it is altogether new in its general features, but because it is more simple than any heretofore offered, besides being easily constructed and very effective.

"The wire imbedded in the vulcanite plate or cap for the teeth can be made of steel or German silver. If of steel, it should be nickel-plated; or, if of German silver, can be easily polished and

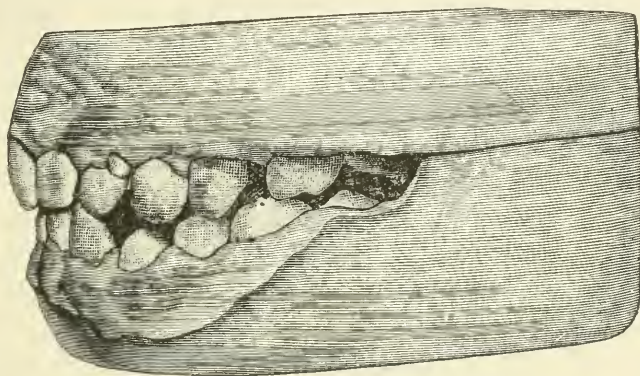


FIG. 37.

plated with gold. The ends can be bent sufficiently toward each other to imbed the whole in a flask for vulcanizing, and can be straightened out again afterward.

"When the appliance is placed in position, if the ends of the wire project too far from the corners of the mouth and are in the way, they can be bent toward the cheeks and made to conform to their curves without touching them. It is acknowledged that the appliance as a whole is large, cumbersome and awkward; but it is only to be used in cases where a simple appliance inside of the mouth cannot be effective."

REFERENCES.

1. Dental Cosmos. 2. Dental Cosmos. 3. Amer. Syst. of Dentistry. 4. Boston Med. and Surg. Journal. 5, 6. Kingsley's Oral Deformities.

[Undated references apply to journals published in 1887, and original articles can be found by consulting the indexes of the respective publications.]

SURGICAL DRESSINGS.

By CHARLES WIRGMAN, M.D.,

PHILADELPHIA.

WHILE really new suggestions have been comparatively few during the past year, much has been added to the evidence attesting to the value of antiseptics in surgery, which hold in their wake two very important elements of success,—cleanliness and attention to details. There are still a few eminent dissenters, but the indications are that ere many years antiseptics will enjoy universal acceptance.

Disinfection of the Hands.—Dr. Vogel,¹ of Eiselberg, anoints the hands thoroughly with warm oil, and then rubs powdered borax over them. In most European hospitals turpentine is used; after this the hands are washed in 1-1000 bichloride of mercury solution. Kummel² advises washing the hands for five minutes with potassium soap, then with a 5 per cent. carbolic acid solution. Belaieff³ recommends that the hands be washed with a salve containing aqua marine, 1 part to 8 of vaseline, then scrubbed with soap and brush until all color disappears, when a thorough douching in a 1-2000 sublimate solution completes the process.

Disinfection of Instruments.—M. Redard⁵ maintains that chemical agents are not sufficient for disinfecting surgical instruments, and has invented an oven for this purpose, heating the instruments to 120° C. Kocher, of Berne, and Bergmann, of Berlin, use similar ovens in their wards. M. Championnière,⁶ in discussing Redard's method, thought it better than that habitually employed, and that it might be advantageous in disinfecting surgical dressings.

Disinfection of Sponges.—In Mt. Sinai⁷ Hospital, New York, the raw sponges are beaten until freed from sand and lime, then immersed in dilute muriatic acid for ten minutes. They are afterward washed with green soap and water; and placed in a 5 per cent. solution of carbolic acid, until needed. Bernbeck⁸ suggests the following mode of preparing sponges: Take moderately porous sponges freed from sand by beating them with sticks, and washed in a sieve until the water runs off free from sediment: soak two hours

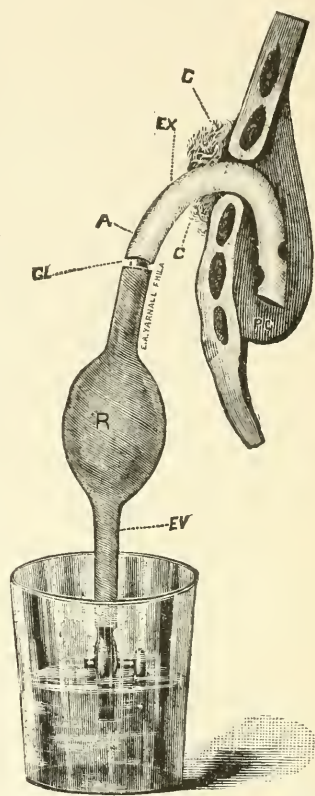
in 1-1000 solution potassium permanganate, adding crude hydrochloric acid until the violet disappears; being thus bleached, freed from the residue lime and made antiseptic, wash in water until litmus no longer reddens. Morton,⁹ of Philadelphia, advises that sponges be kept in a 1-1000 sublimate solution and used but once.

Styptics.—Dr. Christie¹⁰ has for some time used ferric alum as a local styptic, and believes it to possess antiseptic properties. Although a powerful coagulator of albumen, it has no irritating or destructive action on living tissues. Henocque,¹¹ Huchard and Goetz recommend antipyrine locally, for bleeding at the nose and in superficial wounds. Dr. Lee,¹² of England, advises the use of the actual cautery in all operations to arrest hæmorrhage, and on account of its antiseptic properties. He thinks the oxide of iron, as well as the heat, appear to exercise a direct influence on the coagulation of the blood. He speaks of the importance of not applying the cautery too hot, or great destruction of the adjacent parts will be produced. The superficial layer of the part to which the cautery is applied is killed and charred, so that it is not liable to septic decomposition. Nussbaum,¹³ of Munich, in parenchymatous bleeding from the liver, uses tampons of cotton soaked in peroxide of hydrogen, and claims excellent results from this method.

Drainage.—Latterly views have been introduced to the effect that dryness is not essential for rapid healing of wounds after operations, and at the last French Medical Congress a majority of the members believed that when perfect antisepsis had been practiced, it was better to leave out the drainage-tube and ignore the effusion of blood. This method Schede, of Hamburg, adopted in a large number of patients, particularly in cases of excision of bone; out of 240 cases he reports 222 as perfectly satisfactory, the coagulum being transformed into a solid cicatrix without any suppuration.

Turraza,¹⁴ of Italy, considers hæmorrhage, when not due to lesion of large vessels, or carried to excess, as of small importance; and from his experience concludes that in wounds perfectly disinfected, an effusion of blood is of advantage: it fills up the cavity of the wound, prevents the formation of empty spaces, rendering compression and drainage useless. He believes that the organization of the clot favors healing. He has almost discarded the drainage-tube because he thinks it increases septic risks and removes fluids which in an aseptic condition may be useful by reabsorption.

Dr. Herbert Page,¹⁵ of England, considers the drainage-tube rarely demanded for more than 16 hours, and only needed to remove the effusion which, if excessive, increases tension,—thus interfering with rest and apposition of the divided tissues. The articles most used in drainage are bunches of fine catgut, perforated rubber tubes, decalcified bones, and parchment. Catgut in hanks of from 5 to 12 strands can be depended on when primary union is expected: it is absorbed in about ten days. As it acts by capillarity it will not drain pus; so in abscesses and wounds liable to suppurate, the rubber tubing will be most suitable. If the tubing is used in wounds when primary union is expected, it should be removed early. Decalcified bone cannot be relied on for more than ten days, and has fallen into disuse in some of the hospitals of England; it is stated also that it renders infection of the wound possible from its animal structure. In large cold abscesses, in chronic bursitis and in pyothorax, Dr. Axlerode,¹⁶ of California, uses the drainage-pump with excellent results. He introduces into the bottom of the cavity (see fig.) a suitable piece of drainage-tubing, PC. The tube is kept in the wound hermetically sealed with cotton collodion, CC, and is connected with a compressible rubber ball through a glass tube GL. The other end of the rubber ball terminates in an evacuating tube EV, which can be closed by a faucet. By means of this pump the pus can be evacuated without admission of air, and the strictest antiseptic precautions be observed, if the end of the tube is kept immersed in some antiseptic solution. It is easy to understand that by means of the rubber ball the pus cavity can either be washed out by pumping into it a desirable antiseptic fluid, or emptied by producing suction. Gersung¹⁷, of Vienna, and Billroth have



AXLERODE'S DRAINAGE-PUMP.
(*Pacific Record of Med. and Surg.*)

found wicking, impregnated with iodoform, an excellent material for draining when the secretions are not large.

Ligatures and Sutures.—Dr. Girdlestone,¹⁹ of Australia, recommends kangaroo tendons in place of silk or catgut, any strand showing longitudinal split or frayed edges being rejected. They should be kept in a 1-5 carbolic oil solution, and, when used, immersed in a solution of carbolic acid and water. Veit,²⁰ of Berlin, prefers the catgut suture, believing that the healing does not depend so much on the suture material as on its antiseptic condition, and thinks this more easily produced with catgut than with silk.

Antiseptic Agents and Dressings.—The following table based on the investigations of Dr. Weeks,²² of New York, shows the effect of some of the germicides in use:—

ANTISEPTIC.	STRENGTH.	DURATION OF EXPOSURE TO DESTROY VITALITY OF GERM.
1. Corrosive sublimate	1 to 500	10 seconds.
	1 to 1,000	45 seconds.
	1 to 2,000	1½ minutes.
	1 to 5,000	3 minutes.
	1 to 10,000	5 minutes.
2. Biniodide of mercury (very insoluble)	1 to 20,000	12-15 minutes.
	1 to 40,000	4 days.
3. Nitrate of silver	1 to 10	4 seconds.
	1 to 50	8 seconds.
	1 to 100	12 seconds.
	1 to 500	1½ minutes.
4. Carbolic acid	1 to 20	15 seconds.
	1 to 40	30-60 seconds.
	1 to 60	4 minutes.
5. Alcohol (no effect on dried germs; very powerful when active in moistened condition)	Absolute alcohol	4-12 seconds.
	95 per cent.	20-30 seconds.
	66 per cent.	10-15 minutes.
6. Salicylic acid (makes a stable solution), 600 parts water	1 to 600	1 minute.
	1 to 1,000	4-5 minutes.
7. Permanganate of potash (makes an unstable solution in 16 parts water)	1 to 50	20 seconds.
	1 to 100	1 minute.
	1 to 200	5 minutes.
8. Chlorine water, very unstable, best when fresh		1½ minutes.
9. Hydrogen bromide, very unstable, best when fresh		1-1½ minutes.
10. Boric acid had no germicidal action whatever; germs remained unaffected for ten days.		
11. Iodine to saturation in water did not affect germs after 48 hours' exposure.		
12. Chloride of zinc, 1 to 20 in water, had no effect.		
13. Oil of turpentine, 1 to 20 in water, had no effect.		
14. Thymol, 1 to 20 in water, had no effect.		
15. Eucalyptol, 1 to 20 in water, had no effect.		
16. Ointments of 10 per cent. of iodoform and of iodol of the same strength had no effect after 36 hours' exposure.		
17. Iodoform in powder only retarded development of germs after 12 hours' exposure.		
18. Iodol, bismuth subnitrate and boric acid in powder exerted no effect.		
19. Boiling water, and in fact heat from 165.2° to 212° F., destroyed germ life on contact.		

Angerer,²³ of Munich, has observed that in using corrosive sublimate with undistilled water, an insoluble precipitate is thrown down, and he advises that equal parts of sodium chloride be used with the mercuric chloride to prevent this. Koch,²⁴ in 1881, demonstrated by experiments that bichloride of mercury was the best antiseptic, but it has been found when used in albuminous fluids that an insoluble precipitate, the albuminate of mercury, was formed. A similar change takes place in the blood when mercuric chloride comes in contact with the albumen of that fluid; the precipitate thus formed, and the supernatant fluid having no antiseptic properties. Dr. Laplace, of New Orleans, working under Koch, perceived the importance of preventing this precipitate, and after numerous experiments found that the addition of an acid prevented its formation. He advises 5 parts of hydrochloric acid to 1000 parts of corrosive sublimate solution (1-1000). He also concludes, from his experiments, that the acid medium is unfavorable to the development of germs, so increasing the disinfecting power that a much weaker solution is required. The fact²⁵ that mercuric chloride is readily absorbed is usually admitted, and the greatest caution should be observed in its use. Especially is it dangerous when used as an injection into cavities. The remaining liquid should always be washed out. Many deaths have been reported from the careless use of this agent.

Dr. Knox²⁶ has seen two cases of eczema follow the use of corrosive sublimate, as a dressing. Dr. Bolshesolsky,²⁷ of St. Petersburg, from experimental and clinical evidence, concludes that the biniodide of mercury is a more powerful and less dangerous antiseptic than corrosive sublimate. Dr. Lépine²⁸ favors the combination of mercuric chloride, with salicylic, carbolic and benzoic acids, calcium chloride, bromine and hydrobromate of quinine. He thinks that by mixing these substances, powerful antiseptics may be made, which are at the same time devoid of danger to the human organism.

The experiments of Rovsing and Heyn,²⁹ of Copenhagen, seem to prove that iodoform is inert in the presence of bacteria, and they conclude that it is not antiseptic. Dr. de Ruyter,³⁰ at the last Medical Congress in Germany, showed that while the experiments of Rovsing were correct, his conclusions were erroneous. He found that the dry powder exerted no influence on bacteria, but

that in solution it was a powerful antiseptic, and in cases of wounds where there was a secretion of fluids, iodoform prevented infection. He concludes, we think justly, that its antiseptic qualities are only exerted when its chemical decomposition takes place.

Reynolds,³¹ of Philadelphia, uses subiodide of bismuth as an antiseptic dressing. The advantages claimed for it over iodoform is that it has no odor, nor is there danger of absorption. Huppe,³² from his experiments, thinks that aseptol or orthophenol sulphuric acid is entitled to rank with carbolic acid or corrosive sublimate, as an antiseptic. Trichlorphenol,³³ which can be made by mixing a 4 per cent. solution of carbolic acid, with 5 parts of a saturated solution of chlorinated lime, is used in Russia, and is said to be 25 times more powerful than carbolic acid. Its use so far has been chiefly in epidemic erysipelas. M. Nerki³⁴ attributes to salol, or salicylate of phenol, about the same antiseptic properties which salicylate acid possesses. Dr. Hunter McGuire, of Richmond, uses hydrate of chloral, 2 grs. to the ounce of water, as an antiseptic.

Championnière³⁵ recommends turf wool, as an absorbent in all wounds in which the discharges are foetid; the wool should be first sterilized by heat. Gedeke³⁶ has found, in cases of emergency, filter paper steeped in a 2 per cent. solution of corrosive sublimate, a useful antiseptic dressing. Lediarell³⁷ advises the use of moss, dampened with some antiseptic solution, in large suppurating wounds. Port,³⁸ of the German Army, thinks wood fibre an excellent basis for dressings, it being of an absorbent nature. Sawdust, medicated with carbolic acid and corrosive sublimate, is used by Thomas, of Liverpool, in compound fractures and lithotomy.

REFERENCES.

1. Med. and Surg. Reporter.
2. Therapeutic Gaz.
3. Therapeutic Gaz.
4. Med. News.
5. London Med. Rec.
6. Brit. Med. Jour.
7. N.Y. Med. Jour.
8. Med. and Surg. Reporter.
9. N.Y. Med. Jour.
10. Am. Med. Digest.
11. Med. News.
12. Lancet.
13. Deut. Med. Woch.
14. Annals of Surg.
15. Brit. Med. Jour.
16. Pacific Rec.
17. Med. News.
18. New Orleans Med. and Surg. Jour.
19. Lancet.
20. Therap. Monatsch.
21. Jour. Am. Med. Assoc.
22. Med. News.
23. Med. News.
24. New Orleans Surg. and Med. Jour.
25. Med. Press and Circular.
26. Glasgow Med. Jour.
27. Med. and Surg. Reporter.
28. La Semaine Méd.
29. London Med. Rec.
30. Med. Press.
31. Canadian Pract.
32. Jour. Am. Assoc.
33. Am. Med. Digest.
34. London Med. Rec.
35. London Med. Rec.
36. Pacific Med. and Surg. Jour.
37. Pacific Med. and Surg. Jour.
38. Boston Med. and Surg. Jour.

[Undated references apply to journals published in 1887, and original articles can be found by consulting the indexes of the respective publications.]

CHIROPDISTRY.

By C. C. DAVIDSON, M.D.,

PHILADELPHIA.

IF from infancy to puberty greater care were exercised, loss of symmetry of the foot would be prevented. Putting a child on its feet at too early an age, ere its bones and ligaments are strong enough to bear its weight, permitting it to wear not only shoes, but also stockings, too short, tend to destroy the comeliness of its feet, and to develop what would otherwise have been shapely, into stumpy or flat feet.

It is while the foot is growing that the greatest care should be taken to provide it with properly fitting covering. It then adapts itself to that by which it is surrounded. The stocking should fit the child's foot *well*. It is important that strict attention should be given to this matter, as a short, tight-fitting stocking will cramp the foot: a stocking with a square toe is decidedly preferable.

Dr. Frederick Krause, of Würtemberg, insists that a shoe, giving all the ease and freedom of movement required, should be



KRAUSE'S FOOT MEASUREMENT.

measured by the shoemaker according to the method shown in the annexed diagram. A shoe fitted on a last thus constructed, with a flexible sole of moderate thickness, would preserve the arch of the foot, retain the great toe in its normal position, give the muscles full play, and not impede the

circulation. Then corns, bunions and ingrowing nails would cease to be.

Ingrowing Toe-nails.—One of the results of the pressure of the shoe is an ingrowing nail; or, more properly speaking, an infleshed nail. This affection not only occurs in the great toe, but in all of the others, if the shoes be too narrow, too short, or fit badly across the toes.

The operation performed by Dr. Cotting,¹ of Boston, has been

much discussed during the year, and many surgeons have been very successful with it. Dr. Cotting removes with the knife the diseased fleshy parts, with a thick slice of the healthy side of the toe, the edge of the nail being the limit. A dressing of lint or absorbent cotton is applied by means of a narrow roller bandage, and covered with oiled silk. The contraction of the cicatrizing wound leaves the nail quite free from imbedding tissue.

Secretan² employs the following simple plan: "The triangular tongue of the pocket-case spatula is introduced from before backward between the nail and the subungual skin, the slightly concave face of the instrument looking upward. When the point of the spatula has reached the matrix, the nail is grasped between the thumb and the instrument. A see-saw motion upward and forward is given to the spatula, which is used as a lever of the first order, the point of the toe being the fulcrum. The nail is thus detached and taken away entire, without carrying off any superfluous portion of its bed."

Dr. Trivus,³ of St. Petersburg, removed an ingrowing nail after previously inducing hypnotism. The operation lasted about twenty minutes. At first, the woman moved her foot about; but when Dr. Trivus suggested that no more pain would be inflicted, and that the foot must be kept at rest, she sat quietly until the matrix of the toe was incised, when she shrieked and said that a dog had bitten her. She was awakened after the dressing was applied, and was not aware that the operation had been performed. No pain was felt until the next day.

Dr. Patin,⁴ of Boulogne, after first giving the patient a prolonged hot foot-bath, wipes and dries the part, introduces into the interstices of the nail a solution of ten parts of gutta-percha to eighty parts of chloroform. This is applied frequently during the first few days, and then at longer intervals. When the nail has grown sufficiently, the surgeon cuts it in transversely, taking care to blunt the angles slightly.

Dr. Chandelux,⁵ of Lyons, secures anæsthesia in an operation for ingrowing nail by spraying the toe with ether,—Esmarch's bandage having been previously applied to the limb. In this way anæsthesia is secured in from twenty to forty seconds. The bandage also prevents the flow of blood during the operation, so that the surgeon is able to minutely dissect the parts.

Very frequently a slight inflammation can be allayed by a solution of tannin in water, the affected part to be painted a few times. This will dry up the granulated surfaces and contract the blood-vessels. This treatment is advocated by Miall,⁶ who uses a concentrated solution (1 ounce in 6 drachms pure water, with a gentle heat) painted on the soft parts twice a day.

When very painful inflammation exists and the patient is not confined to his room, it is advisable to cut out that part of the shoe exerting pressure. If he is not compelled to be out-of-doors, a lotion of lead-water and laudanum should be constantly applied until the inflammation is reduced and the pain alleviated. The granulated surface should then be separated from the nail. This can be done by first scraping the side or centre of the nail, rendering it flexible. The edge can then be gently lifted with a flat probe and a *small* pledget of cotton-wool laid between it and the flesh. A solution of nitrate of silver, gr. xxx to the ounce of water, will be found very beneficial.

Onychrophosis.—This disease principally affects the old, and consists of thickened, horny layers of the epidermis accumulated under the toe-nail, raising the nail from its bed and sometimes altering its growth. In severe cases this disorder interferes with locomotion. The origin is often obscure. Neglect or low condition of the system may cause it, or it may be idiopathic or sympathetic. It is sometimes mistaken for ingrowing toe-nail. The portion of the nail covering the diseased part should be first removed. The growth underneath can then be gradually and carefully taken away; after which astringents may be applied to complete the cure and prevent recurrence.

Onychia.—In this disease the matrix of the nail is attacked, creating ulcerations which gradually involve the soft textures. It arises from an unhealthy condition of the system or from an injury, such as a bruise, etc. In mild cases the inflammation is found on one side only, affecting the margin of the nail. It is often found in children, brought on by contusions. In severe cases the nail becomes loosened by the ulcerations beneath it, and the root and edges are roughened. This disease is very troublesome, and is known as “*onychia maligna*.” The granulating surface must be separated from the edge of the nail by pledgets of cotton-wool, followed by applications of nitrate of silver 20 grains to the ounce.

CORNES.

Corns may be considered as another form of foot trouble caused by the pressing of the shoe-leather upon the foot, cramping of the toes, and crowding them together. The most painful variety is the soft corn,—an excrescence which appears between the toes, caused by the perspiration collecting and condensing by the pressure of the shoe, crowding the joint of one toe against that of its neighbor. A soft corn is generally of a whitish yellow or grayish color: sometimes, however, it is quite dark, this change in color being due to extravasated blood. While very loose boots are also productive of corns, narrow ones pointed at the toes are more likely to develop soft corns, as the toes are not only pressed together at the ends, but also at the metatarsal joints.

The thickened cuticle comprising the soft corn should be extracted or removed, if it has not burrowed into the tissues, as is sometimes the case: here an escharotic is essential. When suppuration has followed neglect or want of immediate attention, it is necessary to open the abscess to allow the pus to escape. Ulceration often ensues; the joints may become perforated and the bones destroyed. The treatment in severe cases should be regulated according to the symptoms and the amount of local inflammation present. Even the age of the patient should be taken into consideration, as fatal results have followed the maltreatment of what is often termed “only a corn.”

The most troublesome form of the hard corn appears under the great toe, and is generally caused by an accident or bruise. When found at the bottom of the foot, it is due to a peg or some roughness in the insole, friction of badly fitting stockings, or loose shoes, permitting the foot to slide up and down when walking.

The treatment indicated in all these conditions is removal; but lasting benefit will not be derived unless the pressure from which the trouble originated be discontinued.

Vascular Excrescences.—These excrescences may be produced on any part of the foot, and give rise to severe burning sensations while walking or standing. Sometimes rough, uneven stockings will originate the trouble. When irritated, these morbid growths become vascular, and on being removed by the knife will often bleed profusely, composed, as they are, of small blood-vessels.

Notwithstanding this they should be cut at intervals and then cauterized after each operation. In time this will destroy them.

Bunions.—It is an erroneous supposition that bunions are found only upon the great-toe joint, as they can occur on any joint. In the majority of cases, however, they are located over the metatarso-phalangeal joint, the overlying bursa of which becomes inflamed from too much pressure. Short boots or shoes, and leather lacking elasticity, are in almost every case the exciting causes. The lateral or longitudinal pressure of the tight boot or shoe will cause stretching of the ligaments of the joint. The toe is then forced outward or inward, either over or under its neighbor. Where the pressure is greatest, small corns are formed, the points of which press inward and give great pain. When the local inflammation is very great, the bursa mucosa is liable to become disarranged, and the synovial fluid dried up or its channel changed, oftentimes coming to the surface, causing a watery discharge.

Dr. Robert T. Morris⁷ states that the shoe should be made broad, nearly straight on the inner side. There should be a separate compartment formed by a strip of leather sewed into the welt of the shoe to retain the great toe in normal line. If necessary, the ligament should be cut, or the head of the metatarsal bone excised and a retaining splint be worn during the healing process, and the compartment shoe subsequently. Gross⁸ advocates the wearing of a broad boot, removing the skin from the bunion by a blister, and applying equal parts of cosmoline and tannic acid.

Tincture of iodine and tincture of belladonna, equal parts, applied twice daily is also advantageous. As soon as the bunion becomes less tender to the touch, a bandage should be wound around the foot, commencing at the lower half of the joint, so as to hold the toe in its natural position. This bandage should be applied twice in a week, and a compress of lamb's wool placed between the great toe and its neighbor. This treatment should be continued for six or eight weeks.

Chilblains.—This painful and annoying affection of the skin occurs in adults or children whose vitality has been lowered or whose constitution is impaired. It may be produced by tight boots, which retard the circulation and prevent the feet from becoming warm. It is liable to attack the very young or the aged. In the case of the adult, it is not always the intensity of the cold which

brings on the attack as much as the reduced strength, which causes, with the return of cold weather, a retardation of the circulation of the blood. This retardation gives the skin (in chilblains) a bluish-red color, which will deepen on the application of warmth, and disappear if pressure be applied. A burning, itching sensation is ever present, and continues with more or less intensity for a long time. The toes are the most liable, although other parts of the feet are similarly afflicted. Neglect, a bruise, fracture, etc., may cause ulcerations from which are discharged a bloody serum; and very serious running sores are engendered, burrowing into the bone and difficult to heal.

The lowered state of the system which caused the condition, if the patient be an adult, should be taken first into consideration and remedied. The feet should be encased in woolen stockings and kept warm, as no treatment will be efficacious in chilblains while the sufferer is exposed to the cold. In the first stage of the disease, gentle friction should be used with chloroform liniment or camphorated oil. When swollen or granulated, the parts can be painted with tincture of iodine. Bathing the feet in alum-water is beneficial. Equal parts of cosmoline and turpentine, to which can be added 10 grains to the ounce carbolic acid, makes an excellent ointment. Balsam of Peru, if ulcerations have appeared, is most beneficial.

REFERENCES.

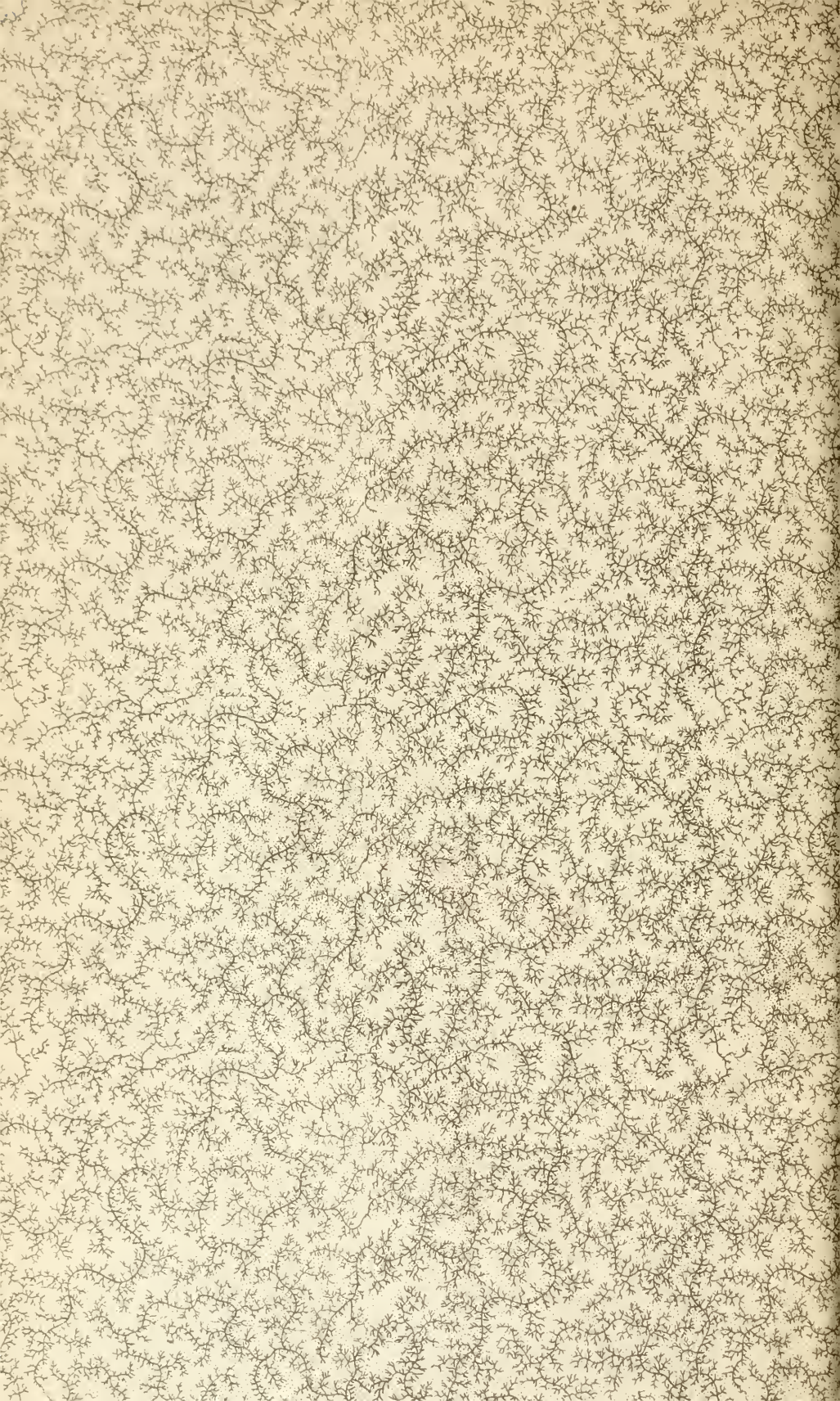
1. Boston M. and S. Jour. 2. London Med. Rec. 3. Vratsch. 4. Gaz. des Hôpitaux. 5. Lancet. 6. Brit. Med. Jour. 7. Med. and Surg. Rep. 8. Coll. and Clin. Rec.

[Undated references apply to journals published in 1887, and original articles can be found by consulting the indexes of the respective publications.]



STORAGE





STORAGE

